AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)		RATING	PAGE 1 OF PAGES 33
2. CONTRACT (Proc. Inst. Ident.) NO. HDTRA1-13-C-0029-P00003	3. EFFECTIVE DATE 18 Jan 2013	4. REQUISITION/PURCHASE REQUEST/PROJECT NO. CBA5882	

5. ISSUED BY CODE HDTRA1 DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	6. ADMINISTERED BY (If other than Item 5) CODE N62879 OFFICE OF NAVAL RESEARCH 495 SUMMER ST, ROOM 627 BOSTON MA 02210-2109
7. NAME AND ADDRESS OF CONTRACTOR (No. street, city, county, state and zip code) ECOHEALTH ALLIANCE INC MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320 CODE 3MMU3 FACILITY CODE	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below) 9. DISCOUNT FOR PROMPT PAYMENT NET 30 DAYS 10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: ITEM
11. SHIP TO/MARK FOR CODE HDTRA1 DEFENSE THREAT REDUCTION AGENCY/J9CBA TO BE ADDRESSED IN SEPARATE LETTER 8725 JOHN J. KINGMAN ROAD-MS 6201 FORT BELVOIR VA 22060	12. PAYMENT WILL BE MADE BY CODE HQ0337 DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182266 COLUMBUS OH 43218-2266
13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: [ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	14. ACCOUNTING AND APPROPRIATION DATA **See Schedule**

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				
				15G. TOTAL AMOUNT OF CONTRACT	**$2,328,756.00 EST**

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(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
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CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. [X] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 1 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER (b)(6) TEL: (b)(6) EMAIL: (b)(6)	
19B. NAME OF CONTRACTOR BY _____ (Signature of person authorized to sign)	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA (b)(6) (Signature of Contracting Officer)
		20C. DATE SIGNED 17-Jan-2013

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Prescribed by GSA
FAR (48 CFR) 53.214(a)

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001			Lot		$2,328,756.00

Base Period

COST

The Contractor shall perform the services as delineated in accordance with the attached Statement of Work (SOW) entitled "Rapid Identification Tool (RIT) for Undiagnosed Emerging Infectious Disease (EID) Events," dated August 23, 2013. The referenced SOW is identified as Attachment 1 to this contract.

FOB: Destination

PURCHASE REQUEST NUMBER: CBA5882

ESTIMATED COST $2,328,756.00 (EST.)

ACRN AA $0.00
CIN: CBA58820001

PSC Code: AD92

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Funding in support of CLIN0001

COST

FOB: Destination

ESTIMATED COST $0.00

ACRN AA $394,696.00
CIN: CBA5882000101

PSC Code: AD92

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000102					$0.00
	Funding in support of CLIN0001				
	COST				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AB				$976,915.00
	CIN: CBA9910000102				

PSC Code: AD92

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000103					$0.00
	Funding in Support of CLIN0001				
	COST				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AC				$373,924.32
	CIN: J9CBA12612000103				

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000104					$0.00
	Funding in Support of CLIN0001				
	COST				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AD				$479,599.18
	CIN: J9CBA12612000104				

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002			Lot		NSP

Contract Data Requirements Lists (CDRLs)

COST

The Contractor shall prepare and submit Contract Data Requirements Lists (CDRLs) in accordance with the individual instructions delineated under each CDRL enclosed under Exhibit A of this contract.

FOB: Destination

ESTIMATED COST $0.00

PSC Code: AD92

BAA REFERENCE

The solicitation forming the basis of this contract award is Broad Agency Announcement (BAA) No. HDTRA1-11-16-RDIS-BAA.

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252.247-9001 PACKAGING AND MARKING

(a) All data contained in Exhibit A, Contract Data Requirements List (CDRL), DD Form 1423 delivered under this contract shall be delivered using best commercial practices to meet the packaging requirements of the carrier and to insure delivery, to the addressees specified on the Data Item Cover Sheet, at destination and in accordance with applicable security requirements.

(b) All data and correspondence submitted to the Contracting Officer shall reference the Contract Number, the CDRL number, and the date submitted. A copy of all correspondence sent to the Contracting Officer's Representative (COR) or Project Manager shall be simultaneously provided to the Contracting Officer.

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
000101	Destination	Government	Destination	Government
000102	Destination	Government	Destination	Government
000103	N/A	N/A	N/A	Government
000104	N/A	N/A	N/A	Government
0002	N/A	N/A	N/A	Government

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252.246-9000 INSPECTION AND ACCEPTANCE (JUL 2007)

Government inspection and acceptance of data is specified on the Contract Data Requirements List, DD Form 1423. In accordance with FAR 52.246-9, inspection and acceptance for all work performed at any and all times under this contract shall be the responsibility of the:

__X__ Contracting Officer's Representative (COR) or Project Manager (PM). The Wide Area Work Flow (WAWF) Acceptor DoDDAC is located in DTRA 252.201-9000 *Project Manager* or DTRA 252.201-9002 *Contracting Officer's Representative*.

_____ Administrative Contracting Officer (ACO). The WAWF Acceptor DoDAAC can be found in the "Administered By" block on page 1 of the contract.

(End of Clause)

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 18-JAN-2013 TO 17-JAN-2015	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA TO BE ADDRESSED IN SEPARATE LETTER 8725 JOHN J. KINGMAN ROAD-MS 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A
000103	N/A	N/A	N/A	N/A
000104	N/A	N/A	N/A	N/A
0002	POP 18-JAN-2013 TO 17-JAN-2015	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA TO BE ADDRESSED IN SEPARATE LETTER 8725 JOHN J. KINGMAN ROAD-MS 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1

CLAUSES INCORPORATED BY REFERENCE

52.242-15	Stop-Work Order	AUG 1989
52.247-34	F.O.B. Destination	NOV 1991

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0400 000 N 20122013 D 2620 0602384BP-CB-YTM 1213-0400-2620-TM2DN DTRA 255
AMOUNT: $394,696.00
CIN CBA58820001: $0.00
CIN CBA5882000101: $394,696.00

AB: 044315 097 0400 000 N 20132014 D 2620 0602384BP-CB-CBA 1314-0400-2620-TM2DN DTRA 255
AMOUNT: $976,915.00
CIN CBA9910000102: $976,915.00

AC: 044315 097 0400 000 N 20142015 D 2620 0602384BP-CB-CBA 1415-0400-2620-TM2DN DTRA 255
AMOUNT: $373,924.32
CIN J9CBA12612000103: $373,924.32

AD: 044315 097 0400 000 N 20142015 D 2620 0603384BP-CB-CBA 1415-0400-2620-TM3BD DTRA 255
AMOUNT: $479,599.18
CIN J9CBA12612000104: $479,599.18

CLAUSES INCORPORATED BY FULL TEXT

252.201-9002 CONTRACTING OFFICER'S REPRESENTATIVE (MAY 2007)

a. The Contracting Officer's Representative (COR) for this contract is:

X (Reference COR Designation Letter)
Defense Threat Reduction Agency/J9CBA
8725 John J. Kingman Rd, MS 6201
Fort Belvoir VA 22060-6201
WAWF Acceptor DoDAAC: HDTRA1

b. The COR will act as the Contracting Officer's Representative for technical matters providing technical direction and discussion as necessary with respect to the specification/statement of work and monitoring the progress and quality of the Contractor's performance. The COR is NOT an Administrative Contracting Officer (ACO) and does not have the authority to take any action, either directly or indirectly that would change the pricing, quality, quantity, place of performance, delivery schedule, or any other terms and conditions of the contract, or to direct the accomplishment of effort, which goes beyond the scope of the specifications/statement of work in the contract.

c. When, in the opinion of the contractor, the COR requests effort outside the existing scope of the contract, the contractor shall promptly notify the Contracting Officer in writing. No action shall be taken by the contractor under such direction until the Contracting Officer has issued a modification to the contract or has otherwise resolved the issue.

252.204-9002 PAYMENT INSTRUCTIONS FOR MULTIPLE ACCOUNTING CLASSIFICATION CITATIONS (MAY 2012)

In accordance with DFARS 204.7108 Payment Instructions, payment shall be made by the numbered payment instruction identified below:

____ (1) Line item specific: single funding.
252.204-0001 Line Item Specific: Single Funding. (SEP 2009)

If there is only one source of funding for the contract line item (i.e., one ACRN), the payment office will make payment using the ACRN funding of the line item being billed.

__X___ (2) Line item specific: sequential ACRN order.
252.204-0002 Line Item Specific: Sequential ACRN Order. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment in sequential ACRN order within the line item, exhausting all funds in the previous ACRN before paying from the next ACRN using the following sequential order: Alpha/Alpha; Alpha/Numeric; Numeric/Alpha; and Numeric/Numeric.

_____ (3) Line item specific: contracting officer specified ACRN order.
252.204-0003 Line Item Specific: Contracting Officer Specified ACRN Order. (SEP 2009)

If there is more than one ACRN within a contract line item,
The payment office shall make payment within the line item in the sequence ACRN order specified below, exhausting all funds in the previous ACRN before paying from the next ACRN.
Line Item ACRN Order

_____ _____
_____ _____

_____ (4) Line item specific: by fiscal year.
252.204-0004 Line Item Specific: by Fiscal Year. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment using the oldest fiscal year appropriations first, exhausting all funds in the previous fiscal year before disbursing from the next fiscal year. In the event there is more than one ACRN associated with the same fiscal year, the payment amount shall be disbursed from each ACRN within a fiscal year in the same proportion as the amount of funding obligated for each ACRN within the fiscal year.

_____ (5) Line item specific: by cancellation date.
252.204-0005 Line Item Specific: by Cancellation Date. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment using the ACRN with the earliest cancellation date first, exhausting all funds in that ACRN before disbursing funds from the next. In the event there is more than one ACRN associated with the same cancellation date, the payment amount shall be disbursed from each ACRN with the same cancellation date in the same proportion as the amount of funding obligated for each ACRN with the same cancellation date.

_____ (6) Line item specific: proration.
252.204-0006 Line Item Specific: Proration. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment from each ACRN in the same proportion as the amount of funding currently unliquidated for each ACRN.

_____ (7) Contract-wide: sequential ACRN order.

252.204-0007 Contract-wide: Sequential ACRN Order. (SEP 2009)

The payment office will make payment in sequential ACRN order within the contract or order, exhausting all funds in the previous ACRN before paying from the next ACRN using the following sequential order: alpha/alpha; alpha/numeric; numeric/alpha; and numeric/numeric.

_____ (8) Contract-wide: contracting officer specified ACRN order
252.204-0008 Contract-wide: Contracting Officer Specified ACRN Order. (SEP 2009)

The payment office will make payment in sequential ACRN order within the contract or order, exhausting all funds in the previous ACRN before paying from the next ACRN in the sequence order specified by the contracting officer.

ACRN Order

_____

_____

_____ (9) Contract-wide: by fiscal year.
252.204-0009 Contract-wide: by Fiscal Year. (SEP 2009)

The payment office will make payment using the oldest fiscal year appropriations first, exhausting all funds in the previous fiscal year before disbursing from the next fiscal year. In the event there is more than one ACRN associated with the same fiscal year, the payment amount shall be disbursed from each ACRN within a fiscal year in the same proportion as the amount of funding obligated for each ACRN within the fiscal year.

_____ (10) Contract-wide: by cancellation date.
252.204-0010 Contract-wide: by Cancellation Date. (SEP 2009)

The payment office will make payment using the ACRN with the earliest cancellation date first, exhausting all funds in that ACRN before disbursing funds from the next. In the event there is more than one ACRN associated with the same cancellation date, the payment amount shall be disbursed from each ACRN with the same cancellation date in the same proportion as the amount of funding obligated for each ACRN with the same cancellation date.

_____ (11) Contract-wide: proration.
252.204-0011 Contract-wide: Proration. (SEP 2009)

The payment office will make payment from each ACRN within the contract or order in the same proportion as the amount of funding currently unliquidated for each ACRN.

_____ (12) Other.

If none of the standard payment instructions identified in paragraphs (d)(1) through (11) of this section are appropriate, the contracting officer may insert other payment instructions, provided the other payment instructions--
(i) Provide a significantly better reflection of how funds will be expended in support of contract performance; and
(ii) Are agreed to by the payment office and the contract administration office.

CLAUSES INCORPORATED BY FULL TEXT

252.216-9005 PROFIT OR FEE ON TRAVEL COSTS (JUL 2008)

Travel shall not be a profit or fee bearing cost element.

(End of clause)

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252.232-9012 WIDE AREA WORK FLOW (WAWF) – RECEIPT AND ACCEPTANCE (RA) INSTRUCTIONS (November 2011)

(a) As prescribed in DFARS clause 252.232-7003 Electronic Submission of Payment Requests (Jan 2004), Contractors must submit payment requests in electronic form. Paper copies will no longer be accepted or processed for payment unless the conditions of DFARS clause 252.232-7003(c) apply. To facilitate this electronic submission, the Defense Threat Reduction Agency (DTRA) has implemented the DoD sanctioned Wide Area Workflow-Receipt and Acceptance (WAWF-RA) for contractors to submit electronic payment requests and receiving reports. The contractor shall submit electronic payment requests and receiving reports via WAWF-RA. **Vendors shall send an email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract by clicking on the Send Additional Email Notifications link upon every submission of an invoice/cost voucher in WAWF-RA. To access WAWF, go to https://wawf.eb.mil.**

**** For questions, contact the DTRA WAWF Team at wawfhelp@dtra.mil ****

(b) Definitions:

Acceptor: Contracting Officer's Representative, Program/Project Manager, or other government acceptance official as identified in the contract/order.

Pay Official: Defense Finance and Accounting Service (DFAS) payment office identified in the contract/order.

SHIP To/Service Acceptor DoDAAC: Acceptor DoDAAC or DCMA DoDAAC (as specified in the contract/order).

DCAA Auditor DoDAAC: Needed when invoicing on cost-reimbursable contracts. (Go to www.dcaa.mil and click on the appropriate link under the Audit Office Locator to search for your DCAA DoDAAC.)

>>>>> For contracts that are administered by the **Office of Naval Research (ONR)**: <<<<<
Enter the ONR DoDAAC in the DCAA Auditor DoDAAC field in WAWF.

(c) WAWF Contractor Input Information:

The contractor shall use the following information in creating electronic payment requests in WAWF:

Invoice Type in WAWF:

If billing for Cost Type/Reimbursable contracts (including T&M and LH), select "Cost Voucher"
If billing for Firm-Fixed Price (FFP) Materials Only, select "Combo"
If billing for FFP Materials and Service, select "Combo"
If billing for FFP Services Only, select "2-n-1 (Services Only)"

** If the contract contains both FFP and Cost Type (including T&M and LH) line items, they must be invoiced separately on appropriate types mentioned above. Upon the written approval of the Project Manager or Contracting Officer's Representative, the contractor may invoice both line items in one type of invoice.

For WAWF Routing Information, See Table Below:

Description	SF 26	SF 33	SF 1449	DD 1155

	Located in Block/Section			
Contract Number	2	2	2	1
Delivery Order	See Individual Order		4	2
CAGE Code	7	15a	17a	9
Pay DoDAAC	12	25	18a	15
Inspection	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Acceptance	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Issue Date	3	5	3	3
Issue By DoDAAC	5	7	9	6
Admin DoDAAC	6	24	16	7
Ship To / Service Acceptor DoDAAC	6	24	16	7
Ship to Extension	Do Not Fill In			
Services or Supplies	Based on majority of requirement as determined by monetary value			
Final Invoice?	Do not change "N" (no) to "Y" (yes) unless this is the last invoice and the contract is ready for closeout.			

(d) Final Invoices/Vouchers -Final Payment shall be made in accordance with the Federal Acquisition Regulation (FAR) 52.216-7, entitled "Allowable Cost and Payment."

Invoices - Invoice 2-n-1 (Services Only) and Invoice and Receiving Report (Combo)
Select the ***"Y"*** selection from the "***Final Invoice?"*** drop-down box when submitting the final invoice for payment for a contract. Upon successful submission of the final invoice, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract.

Cost Vouchers - Once the final DCAA audit is complete for cost reimbursable contracts and authorization is received to submit the final cost voucher, select the ***"Y"*** selection from the "***Final Voucher"*** drop-down box when submitting the final cost voucher. Upon successful submission of the final cost voucher, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the following email address: finalcostvouchers@dtra.mil

(e) WAWF Training may be accessed online at http://www.wawftraining.com. To practice creating documents in WAWF, visit the practice site at https://wawftraining.eb.mil. General DFAS information may be accessed using the DFAS website at http://www.dfas.mil/. Payment status information may be accessed using the myInvoice system at https://myinvoice.csd.disa.mil. Your contract number and shipment/invoice number will be required to check status of your payment.
Note: For specific invoice related inquiries email: vendorpay@dtra.mil. Vendors shall forward any additional DTRA related WAWF questions to wawfhelp@dtra.mil.

252.242-9003 - ASSIGNMENT OF CONTRACT ADMINISTRATION SERVICES (CAS) FUNCTIONS (FEB 2012)

a. The contract administration functions stated in FAR 42.302(a) are assigned to: See Page 1, Section A, Block 6 of this contract.

b. Notwithstanding that assignment, in accordance with FAR 42.202(b)(2), the following functions are determined to be best performed by the PCO and are retained by the DTRA Contracting Office:

(1) FAR 42.302(a)(3) Conduct post-award orientation conferences.

(2) FAR 42.302(a)(20) Ensure processing and execution of duty-free entry certificates.

(3) FAR 42.302(a)(40) Perform engineering surveillance to assess compliance with contractual terms for schedule, cost, and technical performance in the areas of design, development, and production.

(4) FAR 42.302(a)(51) Consent to the placement of subcontracts.

(5) Approval or disapproval of the data items listed on Exhibit A, DD Form 1423, Contract Data Requirements List.

(END OF CLAUSE)

Section H - Special Contract Requirements

CLAUSES INCORPORATED BY FULL TEXT

252.201-9003 LIMITATION OF AUTHORITY (JUN 2009)

No person in the Government, other than a Contracting Officer, has the authority to provide direction to the Contractor, which alters the Contractor's obligations or changes this contract in any way. If any person representing the Government, other than a Contracting Officer, attempts to alter contract obligations, change the contract specifications/statement of work or tells the contractor to perform some effort which the Contractor believes to be outside the scope of this contract, the Contractor shall immediately notify the Procuring Contracting Officer (PCO). Contractor personnel shall not comply with any order or direction which they believe to be outside the scope of this contract unless the order or direction is issued by a Contracting Officer.

CLAUSES INCORPORATED BY FULL TEXT

252.203-9000 Prohibition on the Use of Senior Mentors (JUNE 2010)

(a) The use of senior mentors by the Defense Threat Reduction Agency (DTRA) enhances the readiness of the Agency across a wide range of strategic, operational, joint, functional, technical, management and development mission areas. The relevant prior service, joint force experience, and unique expertise of these senior consultants provide senior leadership with valuable insights and contribute to the continuous improvement of the Agencies' operations.

(b) For the purposes of this clause, Senior Mentor is defined as a retired flag, general or other military officers (O-6) or retired senior civilian official (Senior Executive Service (SES), Senior Level (SL), Scientific and Professional (ST)) who provides expert experience-based mentoring, teaching, training, advice, and recommendations to senior military officers, staffs and students as they participate in war games, warfighting courses, operational planning, operational exercises, and decision-making exercises.

(c) In accordance with Secretary of Defense Memorandum entitled "Policy on Senior Mentors" dated April 1, 2010, DTRA will hire all senior mentors as highly qualified experts (HQE) under 5 U.S.C. 9903. This policy balances the need for DTRA to secure the specialized knowledge required for these operational exercises with the need to hire such experts in a manner that promotes public trust and confidence.

(d) The Contractor shall not include the use of senior mentors in bids or proposals for services/supplies offered to DTRA.

(e) The Contractor shall include the substance of this clause in all subcontracts.

(End of Clause)

CLAUSES INCORPORATED BY FULL TEXT

252.203-9004 ETIOLOGIC AGENTS—BIOLOGICAL DEFENSE RESEARCH PROGRAM (FEB 2008)

a. For purpose of this contract etiologic agent--biological defense program is defined as: any viable microorganism, or its toxin which causes or may cause human disease, including those agents listed in 42 CFR 73, 9 CFR 121, and 7 CFR 331, of the Department of Health and Human Services and Department of Agriculture regulations, respectively, and any agent of biological origin that poses a degree of hazard to those agents and is further identified by the US Army. The contractor shall comply with the following when working with etiologic agents:
   (1) 29 Code of Federal Regulations 1910, Occupational Health and Safety;
   (2) US Department of Health and Human Services (DHHS) and US Department of Agriculture, Select Agent Program(s), 42 CFR 73, 9 CFR 121, and 7 CFR 331; and
   (3) DHHS Publication No. 93-8395, Biosafety in Microbiological and Biomedical Laboratories, latest edition.

b. Etiologic agents shall be packaged, labeled, shipped, and transported in accordance with applicable Federal, State, and local laws and regulations, to include:
   (1) 42 CFR 72 (Interstate Shipment of Etiologic Agents);
   (2) 49 CFR 172 and 173 (Department of Transportation);
   (3) 9 CFR 122 (USDA Restricted Animal Pathogens);
   (4) International Air Transport Association Dangerous Goods Regulations;
   (5) The United States Postal Service shall not be used for transportation of BDRP related etiologic agents; and
   (6) If performance is outside of the United States, any additional procedures required by the nation where the work is to be performed.

CLAUSES INCORPORATED BY FULL TEXT

252.209-9002 NON-GOVERNMENT SUPPORT PERSONNEL (JAN 2008)

The following companies may have access to contractor information, technical data or computer software that may be marked as proprietary or otherwise marked with restrictive legends: Suntiva LLC (contract specialist support); Systems Research and Analysis (SRA, managing JPRAS); ITT Corporation (DTRIAC Technical Engineering Services); and TASC (advisory and assistance services). Each contract contains organizational conflict of interest provisions and/or includes contractual requirements for non-disclosure of proprietary contractor information or data/software marked with restrictive legends. The contractor, by submitting a proposal or entering into this contract, is deemed to have consented to the disclosure of its information to Suntiva LLC, SRA, ITT Corp., and TASC under the conditions and limitations described herein.

CLAUSES INCORPORATED BY FULL TEXT

252.215-9004 KEY PERSONNEL (AUG 2012)

The personnel listed below are considered essential to the work being performed hereunder. Prior to removing, replacing, or diverting any of the specified individuals, the Contractor shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this Contract. No deviation shall be made by the Contractor without the prior written consent of the Contracting Officer; provided, that the Contracting Officer authorizes in writing the change, such authorization shall constitute the consent of the Contracting Officer required by this paragraph. The personnel listed below may, with the consent of the contracting parties, be amended from time to time during the course of the Contract to either add or delete personnel as appropriate:

- Principal Investigator

252.216-9003 CONSULTANTS (OCT 1998)

Services of consultants shall be at rates and for periods approved in advance by the Contracting Officer. Requests for approval shall be submitted to the Contracting Officer sufficiently in advance of the need to use a consultant under this Contract. The request shall include (a) a copy of the proposed consultant agreement, (b) a brief biography of the consultant, and (c) an indication of the area(s) in which consultant's expertise will be utilized and why it is essential for contract performance. In addition, significant deviations from the dollar amount approved for consultant services, or changes in the consultants to be utilized, must likewise be approved in advance upon submission of adequate justification.

252.235-9000 SOURCES OF INFORMATION (JULY 2000)

a. The results of the research to be delivered to the Government under this Contract shall embody the most recent reliable information in the field which is available to the Contractor from private and governmental sources, and the Contractor agrees to utilize all sources of such information available to it. In this connection, information in this field which is in the control of DTRA shall, with the consent of the Contracting Officer's Representative (COR) and under such safeguards and procedures as he/she may prescribe, be made available to the Contractor on request. Additionally, the Contractor is encouraged to make use of the resources available through the Defense Threat Reduction Information Analysis Center (DTRIAC), 1680 Texas Street, Southeast, Kirtland AFB, New Mexico 87117.

b. Reasonable assistance in obtaining access to information, or in obtaining permission to use Government or private facilities, will be given to the Contractor by DTRA. Specifically, the Contractor must register with the Defense Technical Information Center, ATTN: DTIC, 8725 John J. Kingman Road, Suite 0944, Fort Belvoir, VA 22060-6218, in accordance with Defense Logistics Agency (DLA) Regulation 4185.10, Certification and Registration for Access to DoD Defense Technical Information. DD Form 1540, the registration form, shall be forwarded to the DTRA Contracting Officer for approval (DFARS 35.010(b)).
(End of clause)

252.235-9001 PROHIBITION OF USE OF LABORATORY ANIMALS (JULY 2010) (DTRA)

The contractor shall obtain approval from the US Army Medical Research and Material Command (MRMC), Animal Care and Use Review Office (ACURO) prior to conducting research on live nonhuman vertebrates. Studies involving non-human primates, dogs, cats, or marine mammals will require a site visit by an ACURO laboratory animal veterinarian as a condition of approval. DoD may also conduct site visits involving research on other animals when deemed appropriate. The animal research facility is responsible for notifying the DoD sponsor if Association for the Assessment and Accreditation of Laboratory Animal Care accreditation is lost or the facility is under USDA inspection. DoD also has the right to a site inspection under these circumstances.

The contractor (including subcontractors) is expressly forbidden to use laboratory animals in any manner whatsoever without the express written approval of MRMC ACURO.

The contractor shall complete the ACURO Animal Use Appendix for Research Involving Animals found at the following web site: https://mrmc-www.army.mil/index.cfm?pageid=Research_Protections.acuro_AnimalAppendix. Submit the completed ACURO appendix, contact information, the DTRA contract number and a copy of the contract for processing to the email address listed at the ACURO website. Once ACURO approves the effort, the contractor will receive written approval to begin animal use from the US Army MRMC ACURO by separate email. The contractor shall promptly provide a copy of the approval to the contracting officer and contracting officer representative. After approval, changes or protocol amendments must be submitted to and approved by ACURO before implementation.

The contractor, or subcontractors as appropriate, shall submit the most recent U.S. Department of Agriculture Animal Care Inspection Report annually in accordance with the CDRL.

Non-compliance with any provision of this clause may result in the termination of the contract.

(End of Clause)

252.247-9000 GOVERNMENT CONTRACTOR TRAVEL (JUL 2007)

The Joint Travel Regulation (JTR), Appendix E, Part I.A.1.b., states invitational travel applies to individuals acting in a capacity that is related directly to, or in connection with, official DOD activities; however, this does not include a contractor's employee traveling in the performance of the contract. Appendix E, Part I.B.4. RESTRICTIONS, further states invitational travel must not be authorized for contractors. Appendix E, Part III states neither the JFTR nor the JTR may be used as official contractor travel regulations as they apply to uniformed personnel and Defense Department civilian employees and contain provisions, the use of which is illegal by contractors. The JTR can be viewed at https://secureapp2.hqda.pentagon.mil/perdiem

Discounts may be obtained for some travel related services (identified below); however, commercial vendors are under no obligation to extend Government rates for the Government's travel and transportation programs to contractors working on behalf of the Federal Government. Contractors must contact their Contracting Officer Representative (COR) to obtain a Government Contractor Official Travel Letter of Identification, signed by the authorizing Contracting Officer.

Contract City-Pair Air Passenger Transportation Program and Other Government Fares. Use of GSA contract city-pair air passenger fares is governed by GSA's contracts with the airlines and

by the Defense Transportation Regulation (DOD 4500.9-R), Part I, Chapter 103. Use of other airfares reserved for Government employees on official business is governed by the airline fare structure and rules. Government contractors are not eligible to participate in the GSA city-pairs program for air passenger transportation services as of October 1, 1998.

Rail Service. Commercial passenger rail vendors may voluntarily offer discount rates to contractors traveling who are on official Government business at the vendor's discretion.

Lodging Programs. GSA and Services' lodging programs may voluntarily offer discount rates to contractors who are on official Government business at the vendor's discretion.

Car Rental Program. Military Surface Deployment and Distribution Command (SDDC) negotiates special rate agreements with car rental companies available to all Government employees and uniformed personnel while traveling on official Government business. Some commercial car rental companies may voluntarily offer similar discount rates to Government contractors at the vendor's discretion.

Section I - Contract Clauses

52.232-99

52.232-99 – Providing Accelerated Payment to Small Business Subcontractors (DEVIATION)
The contracting officer shall insert the following clause in all solicitations and resultant contracts.
Providing Accelerated Payments to Small Business Subcontractors (DEVIATION 2012-00014) (August 2012)
This clause implements the temporary policy provided by OMB Policy Memorandum M-12-16, Providing Prompt Payment to Small Business Subcontractors, dated July 11, 2012.
(a) Upon receipt of accelerated payments from the Government, the contractor is required to make accelerated payments to small business subcontractors to the maximum extent practicable after receipt of a proper invoice and all proper documentation from the small business subcontractor.
(b) Include the substance of this clause, including this paragraph (b), in all subcontracts with small business concerns.
(c) The acceleration of payments under this clause does not provide any new rights under the Prompt Payment Act.
(End of Clause)

CLAUSES INCORPORATED BY REFERENCE

52.202-1	Definitions	JAN 2012
52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	APR 1984
52.203-6	Restrictions On Subcontractor Sales To The Government	SEP 2006
52.203-7	Anti-Kickback Procedures	OCT 2010
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	JAN 1997
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	JAN 1997
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	OCT 2010
52.204-4	Printed or Copied Double-Sided on Postconsumer Fiber Content Paper	MAY 2011
52.204-10	Reporting Executive Compensation and First-Tier Subcontract Awards	AUG 2012
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	DEC 2010
52.209-9	Updates of Publicly Available Information Regarding Responsibility Matters	FEB 2012
52.209-10	Prohibition on Contracting With Inverted Domestic Corporations	MAY 2012
52.215-2 Alt II	Audit and Records--Negotiation (Mar 2009) - Alternate II	APR 1998
52.215-8	Order of Precedence--Uniform Contract Format	OCT 1997
52.215-17	Waiver of Facilities Capital Cost of Money	OCT 1997
52.215-21	Requirements for Certified Cost or Pricing Data or Information Other Than Certified Cost or Pricing Data--Modifications	OCT 2010
52.216-11 Alt I	Cost Contract--No Fee (Apr 1984) Alternate I	APR 1984
52.216-15	Predetermined Indirect Cost Rates	APR 1998
52.219-8	Utilization of Small Business Concerns	JAN 2011
52.219-28	Post-Award Small Business Program Rerepresentation	APR 2012
52.222-3	Convict Labor	JUN 2003
52.222-21	Prohibition Of Segregated Facilities	FEB 1999
52.222-26	Equal Opportunity	MAR 2007
52.222-35	Equal Opportunity for Veterans	SEP 2010

52.222-36	Affirmative Action For Workers With Disabilities	OCT 2010
52.222-37	Employment Reports on Veterans	SEP 2010
52.222-40	Notification of Employee Rights Under the National Labor Relations Act	DEC 2010
52.222-50	Combating Trafficking in Persons	FEB 2009
52.222-54	Employment Eligibility Verification	JUL 2012
52.223-6	Drug-Free Workplace	MAY 2001
52.223-18	Encouraging Contractor Policies To Ban Text Messaging While Driving	AUG 2011
52.225-13	Restrictions on Certain Foreign Purchases	JUN 2008
52.227-1	Authorization and Consent	DEC 2007
52.227-1 Alt I	Authorization And Consent (Dec 2007) - Alternate I	APR 1984
52.227-2	Notice And Assistance Regarding Patent And Copyright Infringement	DEC 2007
52.227-11	Patent Rights--Ownership By The Contractor	DEC 2007
52.228-7	Insurance--Liability To Third Persons	MAR 1996
52.230-5	Cost Accounting Standards--Educational Institutions	MAY 2012
52.230-6	Administration of Cost Accounting Standards	JUN 2010
52.232-9	Limitation On Withholding Of Payments	APR 1984
52.232-17	Interest	OCT 2010
52.232-20	Limitation Of Cost	APR 1984
52.232-23	Assignment Of Claims	JAN 1986
52.232-25 Alt I	Prompt Payment (Oct 2008) Alternate I	FEB 2002
52.232-33	Payment by Electronic Funds Transfer--Central Contractor Registration	OCT 2003
52.232-39	Unenforceability of Unauthorized Obligations	JUN 2013
52.233-1 Alt I	Disputes (Jul 2002) - Alternate I	DEC 1991
52.233-3 Alt I	Protest After Award (Aug 1996) - Alternate I	JUN 1985
52.233-4	Applicable Law for Breach of Contract Claim	OCT 2004
52.242-1	Notice of Intent to Disallow Costs	APR 1984
52.242-4	Certification of Final Indirect Costs	JAN 1997
52.242-13	Bankruptcy	JUL 1995
52.242-15 Alt I	Stop-Work Order (Aug 1989) - Alternate I	APR 1984
52.243-2 Alt V	Changes--Cost-Reimbursement (Aug 1987) - Alternate V	APR 1984
52.244-2 Alt I	Subcontracts (Oct 2010) - Alternate I	JUN 2007
52.244-5	Competition In Subcontracting	DEC 1996
52.244-6	Subcontracts for Commercial Items	DEC 2010
52.245-1	Government Property	APR 2012
52.245-9	Use And Charges	APR 2012
52.246-9	Inspection Of Research And Development (Short Form)	APR 1984
52.246-25	Limitation Of Liability--Services	FEB 1997
52.249-5	Termination For Convenience Of The Government (Educational And Other Nonprofit Institutions)	SEP 1996
52.251-1	Government Supply Sources	APR 2012
52.252-6	Authorized Deviations In Clauses	APR 1984
52.253-1	Computer Generated Forms	JAN 1991
252.201-7000	Contracting Officer's Representative	DEC 1991
252.203-7000	Requirements Relating to Compensation of Former DoD Officials	SEP 2011
252.203-7001	Prohibition On Persons Convicted of Fraud or Other Defense-Contract-Related Felonies	DEC 2008
252.203-7002	Requirement to Inform Employees of Whistleblower Rights	JAN 2009
252.204-7003	Control Of Government Personnel Work Product	APR 1992
252.204-7006	Billing Instructions	OCT 2005
252.204-7008	Export-Controlled Items	APR 2010

252.205-7000	Provision Of Information To Cooperative Agreement Holders	DEC 1991
252.205-7000	Provision Of Information To Cooperative Agreement Holders	DEC 1991
252.209-7004	Subcontracting With Firms That Are Owned or Controlled By The Government of a Terrorist Country	DEC 2006
252.209-7005	Reserve Officer Training Corps and Military Recruiting on Campus	MAR 2012
252.211-7003	Item Identification and Valuation	JUN 2011
252.211-7007	Reporting of Government-Furnished Property	AUG 2012
252.215-7002	Cost Estimating System Requirements	FEB 2012
252.222-7006	Restrictions on the Use of Mandatory Arbitration Agreements	DEC 2010
252.222-7006	Restrictions on the Use of Mandatory Arbitration Agreements	DEC 2010
252.225-7006	Quarterly Reporting of Actual Contract Performance Outside the United States	OCT 2010
252.225-7012	Preference For Certain Domestic Commodities	JUN 2012
252.226-7001	Utilization of Indian Organizations and Indian-Owned Economic Enterprises, and Native Hawaiian Small Business Concerns	SEP 2004
252.227-7013	Rights in Technical Data--Noncommercial Items	FEB 2012
252.227-7014	Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation	MAY 2013
252.227-7016	Rights in Bid or Proposal Information	JAN 2011
252.227-7019	Validation of Asserted Restrictions--Computer Software	SEP 2011
252.227-7027	Deferred Ordering Of Technical Data Or Computer Software	APR 1988
252.227-7030	Technical Data--Withholding Of Payment	MAR 2000
252.227-7037	Validation of Restrictive Markings on Technical Data	JUN 2012
252.227-7039	Patents--Reporting Of Subject Inventions	APR 1990
252.232-7003	Electronic Submission of Payment Requests and Receiving Reports	JUN 2012
252.232-7010	Levies on Contract Payments	DEC 2006
252.235-7002	Animal Welfare	DEC 2011
252.235-7010	Acknowledgment of Support and Disclaimer	MAY 1995
252.235-7011	Final Scientific or Technical Report	NOV 2004
252.242-7006	Accounting System Administration	FEB 2012
252.243-7002	Requests for Equitable Adjustment	MAR 1998
252.244-7000	Subcontracts for Commercial Items and Commercial Components (DoD Contracts)	JUN 2012
252.244-7001	Contractor Purchasing System Administration	JUN 2012
252.245-7001	Tagging, Labeling, and Marking of Government-Furnished Property	APR 2012
252.245-7002	Reporting Loss of Government Property	APR 2012
252.245-7003	Contractor Property Management System Administration	APR 2012
252.245-7004	Reporting, Reutilization, and Disposal	APR 2012
252.247-7023	Transportation of Supplies by Sea	MAY 2002
252.247-7024	Notification Of Transportation Of Supplies By Sea	MAR 2000
252.251-7000	Ordering From Government Supply Sources	AUG 2012

CLAUSES INCORPORATED BY FULL TEXT

52.216-7 ALLOWABLE COST AND PAYMENT (JUN 2011)

(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but (except for small business concerns) not more often than once every 2 weeks, in amounts determined to be allowable by the Contracting Officer in accordance with Federal Acquisition Regulation (FAR) subpart 31.2 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25.

(3) The designated payment office will make interim payments for contract financing on the (Contracting Officer insert day as prescribed by agency head; if not prescribed, insert "30th") day after the designated billing office receives a proper payment request.

In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs. (1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (b)(2) of the clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made--

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of financing payments that have been paid by cash, check, or other forms of payment to subcontractors.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(e) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates. (1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(iii) An adequate indirect cost rate proposal shall include the following data unless otherwise specified by the cognizant Federal agency official:

(A) Summary of all claimed indirect expense rates, including pool, base, and calculated indirect rate.

(B) General and Administrative expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts).

(C) Overhead expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) for each final indirect cost pool.

(D) Occupancy expenses (intermediate indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) and expense reallocation to final indirect cost pools.

(E) Claimed allocation bases, by element of cost, used to distribute indirect costs.

(F) Facilities capital cost of money factors computation.

(G) Reconciliation of books of account (i.e., General Ledger) and claimed direct costs by major cost element.

(H) Schedule of direct costs by contract and subcontract and indirect expense applied at claimed rates, as well as a subsidiary schedule of Government participation percentages in each of the allocation base amounts.

(I) Schedule of cumulative direct and indirect costs claimed and billed by contract and subcontract.

(J) Subcontract information. Listing of subcontracts awarded to companies for which the contractor is the prime or upper-tier contractor (include prime and subcontract numbers; subcontract value and award type; amount claimed during the fiscal year; and the subcontractor name, address, and point of contact information).

(K) Summary of each time-and-materials and labor-hour contract information, including labor ategories, labor rates, hours, and amounts; direct materials; other direct costs; and, indirect expense applied at claimed rates.

(L) Reconciliation of total payroll per IRS form 941 to total labor costs distribution.

(M) Listing of decisions/agreements/approvals and description of accounting/organizational changes.

(N) Certificate of final indirect costs (see 52.242-4,
Certification of Final Indirect Costs).

(O) Contract closing information for contracts physically completed in this fiscal year (include contract number, period of performance, contract ceiling amounts, contract fee computations, level of effort, and indicate if the contract is ready to close).

(iv) The following supplemental information is not required to determine if a proposal is adequate, but may be required during the audit process:

(A) Comparative analysis of indirect expense pools detailed by account to prior fiscal year and budgetary data.

(B) General Organizational information and Executive compensation for the five most highly compensated executives. See 31.205-6(p). Additional salary reference information is available at http://www.whitehouse.gov/omb/procurement_index_exec_comp/.

(C) Identification of prime contracts under which the contractor performs as a subcontractor.

(D) Description of accounting system (excludes contractors required to submit a CAS Disclosure Statement or contractors where the description of the accounting system has not changed from the previous year's submission).

(E) Procedures for identifying and excluding unallowable costs from the costs claimed and billed (excludes contractors where the procedures have not changed from the previous year's submission).

(F) Certified financial statements and other financial data (e.g., trial balance, compilation, review, etc.).

(G) Management letter from outside CPAs concerning any internal control weaknesses.

(H) Actions that have been and/or will be implemented to correct the weaknesses described in the management letter from subparagraph G) of this section.

(I) List of all internal audit reports issued since the last disclosure of internal audit reports to the Government.

(J) Annual internal audit plan of scheduled audits to be performed in the fiscal year when the final indirect cost rate submission is made.

(K) Federal and State income tax returns.

(L) Securities and Exchange Commission 10-K annual report.

(M) Minutes from board of directors meetings.

(N) Listing of delay claims and termination claims submitted which contain costs relating to the subject fiscal year.

(O) Contract briefings, which generally include a synopsis of all pertinent contract provisions, such as: Contract type, contract amount, product or service(s) to be provided, contract performance period, rate ceilings, advance approval requirements, pre-contract cost allowability limitations, and billing limitations.

(v) The Contractor shall update the billings on all contracts to reflect the final settled rates and update the schedule of cumulative direct and indirect costs claimed and billed, as required in paragraph (d)(2)(iii)(I) of this section, within 60 days after settlement of final indirect cost rates.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates. The completion invoice or voucher shall include settled subcontract amounts and rates. The prime contractor is responsible for settling subcontractor amounts and rates included in the completion invoice or voucher and providing status of subcontractor audits to the contracting officer upon request.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may--

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) Adjusted for prior overpayments or underpayments.

(h) Final payment. (1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(4) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.222-2 PAYMENT FOR OVERTIME PREMIUMS (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed $0.00 or the overtime premium is paid for work --

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate

the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

* Insert either "zero" or the dollar amount agreed to during negotiations. The inserted figure does not apply to the exceptions in paragraph (a)(1) through (a)(4) of the clause.

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

https://www.acquisition.gov/far/index.html

(End of clause)

252.204-9001 UNIVERSITIES DISCLOSURE OF INFORMATION (JUL 2009)

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g. film, tape, document) pertaining to any part of this contract or any program related to this contract, unless the information results from fundamental research, as defined below:

> "Fundamental research" as used in this clause, means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

(b) The Contractor shall confer and consult with DTRA on technical aspects of its research and submit technical documents intended for publication to the cognizant DTRA technical representative(s) for review, a minimum of 45 days prior to publication or other dissemination. The purpose of the DTRA review period is to ensure the government ample opportunity to provide comments and suggestions for the researchers' consideration.

(End of clause)

252.223-9004 Environmental, Radiation, Safety Notification, Compliance and Liability (JUN 2013)

(a) Environmental, Radiation, and Safety Notification: The Contractor shall notify the Contracting Officer (CO) and Contracting Officer Representative (COR) of any occurrence of non-compliance with Environmental, Radiation, and Safety regulations that occur at any of the Contractor's facilities at which government property is located as soon as practicable, but not later than 24 hours after identification of an incident. The Contractor shall make initial notification by telephone or email. Then, shall follow-up with a written report within 10 business days.

(b) The Contractor shall notify the CO/COR of any external Environmental, Radiation, and Safety audits or inspections conducted at the facility and provide any reports resulting from the audit. The final report shall be provided to the CO/COR within 30 days following the audit.

(c) The Contractor shall comply with all Federal, State, and local Environmental, Radiation, and Safety regulations, including, without limitation, statutes, ordinances, court orders, consent decrees, administrative orders, or compliance agreements applicable to the facilities where the Government Property is located.

(d) The Contractor shall acquire all necessary permits, and licenses.

(e) DTRA will not be responsible, financially or otherwise, for the investigation, monitoring, cleanup, containment, restoration, removal, or other remedial activity with respect to any hazardous substances present in the soil, ground water, or building(s) that (i) results from activities conducted by entities other than DTRA during the term of this contract, or (ii) results from activities conducted pursuant to any contract, lease, or occupancy agreement that is not associated with DTRA-owned property or activities.

(End of Clause)

252.237-9001 - Enterprise-wide Contractor Manpower Reporting Application (APR 2013)

(a) In accordance with Section 2330a of title 10, United States Code (10 USC 2330a), Contractors shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract via a secure data collection site. The contractor shall completely fill in all required data fields using the following web address: http://www.ecmra.mil/.

(b) Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the help desk at: http://www.ecmra.mil.

(End of Clause)

252.242-9000 CONTRACTOR PERFORMANCE ASSESSMENT REPORTING SYSTEM (CPARS)

1. As required by FAR Part 42.1503, and DTRA policy for the Contractor Performance Assessment Reporting System (CPARS) and Past Performance Automated Information System (PPAIS) effective July, 2001, the Government shall complete a CPAR each year of the period of performance of this contract. The contractor will have an opportunity to provide their comments in each CPAR before it is finalized. In accordance with DTRA CPARS policy the completed CPARs will be entered into the Department of Defense Past Performance Automated Information System (PPAIS), a retrieval system for source selection teams to access the CPARs of contractors' performance. The DTRA CPARS and PPAIS policy includes an explanation of the process and procedures that will be utilized under this contract. A copy is available for contractor reference via the DTRAlink (www.dtra.mil) by accessing Acquisition, How We Do Business.

2. The CPARs shall occur annually in accordance with the schedule established below:

(i) Initial CPAR: 12 months after contract start date (date performance begins)
TBD (by PCO)

(ii) Interim CPAR(s) will be performed annually on the anniversary of the contract start date according to the following schedule:
TBD (by PCO)

(iii) A Final CPAR will be completed upon contract termination, transfer of program management/contract management responsibility outside of DTRA, the delivery of the final end item on contract and/or the completion of the performance period.

(iv) An Out-of-Cycle CPAR may be required when there is a significant change in performance that alters the assessment in one or more evaluation area(s). An Out-of-Cycle CPAR is optional and shall be processed in accordance with Attachment___

3. Each CPAR shall only cover the period elapsing from the last annual CPAR. The final CPAR shall not be used to summarize or "roll-up" the contractor's performance under the entire contract. Each annual CPAR and the final CPAR together will comprise a total picture of contractor performance.

4. At the request of the Government, a verbal, informal review of the Contractor's performance may be held 3-6 months before the completion of the Interim or Final Evaluation periods. This review entails discussing any problems or areas of concern regarding the Contractor's performance to date. No written evaluation form or other formal documentation is required for this evaluation. It may be conducted with the Contractor by telephone, teleconference or face-to-face. This is designed to offer the Contractor an opportunity to correct known deficiencies or weaknesses prior to the formal written evaluation.

5. As set forth in DTRA CPARS policy, any disagreements between the Contractor and the Program Manager regarding the CPAR(s) that cannot be resolved shall be reviewed by the designated Reviewing Official prior to finalization of the CPAR.

6. Special Requirements for Indefinite Delivery Contracts (IDIQ and Requirements type), CPARs shall be processed (select one)

____ for all existing orders (combined) at the time the CPAR is processed

____ on an order-by-order basis

____ on a grouped order basis

7. The policy and procedures set forth in this clause and DTRA CPARS policy are not subject to "Disputes" as described in FAR Part 33.

52.204-99

52.204-99 -- System for Award Management Registration (DEVIATION)

System for Award Management Registration (August 2012) (DEVIATION)

(a) *Definitions.* As used in this clause-

"Central Contractor Registration (CCR) database" means the retired primary Government repository for Contractor information required for the conduct of business with the Government.

"Commercial and Government Entity (CAGE) code" means-

(1) A code assigned by the Defense Logistics Agency (DLA) Logistics Information Service to identify a commercial or Government entity; or

(2) A code assigned by a member of the North Atlantic Treaty Organization that DLA records and maintains in the CAGE master file. This type of code is known as an "NCAGE code."

"Data Universal Numbering System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

"Data Universal Numbering System+4 (DUNS+4) number" means the DUNS number means the number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional SAM records for identifying alternative Electronic Funds Transfer (EFT) accounts (see the FAR at Subpart 32.11) for the same concern.

"Registered in the **SAM** database" means that-

(1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the **SAM** database;

(2) The Contractor's CAGE code is in the **SAM** database; and

(3) The Government has validated all mandatory data fields, to include validation of the Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS), and has marked the record "Active". The Contractor will be required to provide consent for TIN Attachment, Page 1 of 4 validation to the Government as a part of the **SAM** registration process.

"System for Award Management (**SAM**)" means the primary Government repository for prospective federal awardee information and the centralized Government system for certain contracting, grants, and other assistance related processes. It includes-

(1) Data collected from prospective federal awardees required for the conduct of business with the Government;

(2) Prospective contractor submitted annual representations and certifications in accordance with FAR Subpart 4.12; and

(3) The list of all parties suspended, proposed for debarment, debarred, declared ineligible, or excluded or disqualified under the nonprocurement common rule by agencies, Government corporations , or by the Government Accountability Office.

(b)

(1) The Contractor shall be registered in the **SAM** database prior to submitting an invoice and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The SAM registration shall be for the same name and address identified on the contract, with its associated CAGE code and DUNS or DUNS+4.

(3) If indicated by the Government during performance, registration in an alternate system may be required in lieu of **SAM**.

(c) If the Contractor does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) A contractor may obtain a DUNS number-

(i) Via the internet at http://fedgov.dnb.com/webform or if the contractor does not have internet access, it may call Dun and Bradstreet at 1-866-705-5711 if located within the United States; or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office. The contractor should indicate that it is a contractor for a U.S. Government contract when contacting the local Dun and Bradstreet office.

(2) The Contractor should be prepared to provide the following information:

(i) Company legal business name.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company physical street address, city, state and Zip Code.

(iv) Company mailing address, city, state and Zip Code (if separate from physical).

(v) Company telephone number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(d) Reserved.

(e) Processing time for registration in **SAM**, which normally takes five business days, should be taken into consideration when registering. Contractors who are not already registered should consider applying for registration at least two weeks prior to invoicing.

(f) The Contractor is responsible for the accuracy and completeness of the data within the **SAM** database, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the **SAM** database after the initial registration, the Contractor is required to review and update on an annual basis from

the date of initial registration or subsequent updates its information in the **SAM** database to ensure it is current, accurate and complete. Updating information in the **SAM** does not alter the terms and conditions of this contract and is not a substitute for a properly executed contractual document.

(g)

(1)

(i) If a Contractor has legally changed its business name, "doing business as" name, or division name (whichever is shown on the contract), or has transferred the assets used in performing the contract, but has not completed the necessary requirements regarding novation and change-of-name agreements in Subpart 42.12, the Contractor shall provide the responsible Contracting Officer sufficient documentation to support the legally changed name with a minimum of one business day's written notification of its intention to-

(A) Change the name in the SAM database;

(B) Comply with the requirements of subpart 42.12 of the FAR; and

(C) Agree in writing to the timeline and procedures specified by the responsible Contracting Officer.

(ii) If the Contractor fails to comply with the requirements of paragraph (g) (1) (i) of this clause, or fails to perform the agreement at paragraph (g) (1) (i) (C) of this clause, and, in the absence of a properly executed novation or change-of-name agreement, the **SAM** information that shows the Contractor to be other than the Contractor indicated in the contract will be considered to be incorrect information within the meaning of the "Suspension of Payment" paragraph of the electronic funds transfer (EFT) clause of this contract.

(2) The Contractor shall not change the name or address for EFT payments or manual payments, as appropriate, in the **SAM** record to reflect an assignee for the purpose of assignment of claims (see FAR Subpart 32.8, Assignment of Claims). Assignees shall be separately registered in the **SAM** database. Information provided to the Contractor's **SAM** record that indicates payments, including those made by EFT, to an ultimate recipient other than that Contractor will be considered to be incorrect information within the meaning of the "Suspension of payment" paragraph of the EFT clause of this contract.

(h) Contractors may obtain information on registration and annual confirmation requirements via the **SAM** accessed through https://www.acquisition.gov or by calling 866-606-8220, or 334-206-7828 for international calls.

(End of Clause)

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Contract Data Requirements List	8	21-MAY-2014
Attachment 1	Statement of Work	5	16-APR-2014
Attachment 2	Data Rights Assertions List	3	22-OCT-2012

4/16/2014

Global Rapid Identification Tool Set (GRITS) for Infectious Disease Events

Statement of Work (SOW)

1.0 - Objective:

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool Set (GRITS) for undiagnosed outbreaks of emerging infectious diseases (EIDs). GRITS will facilitate rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics. This specialty area combines digital disease surveillance, network analysis, zoonotic disease, and epidemiology. This tool will be a powerful ally for combating the overarching threat of Weapons of Mass Destruction (WMDs) and provide critical early warning necessary for reducing, eliminating, and countering biological threats posed by EIDs to America and its allies.

2.0 - Scope:

The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:

1. Enhance the performance of the GRITS Media Diagnostic tool (GRITS.md)
2. Integrate a network of experts (GRITS.net)
3. Build capabilities for the GRITS platform to handle high-volume, real-time data feeds (GRITS.db)
4. Develop the geospatial capabilities of GRITS (GRITS.geo)
5. Connect GRITS to the EcoHealth Global Repository of Infectious Disease Data (GRID)
6. Develop global geographic and information network models and visualizations for diagnostics (GRITS.path)
7. Develop an interface from the BSVE that allows BSVE users to interact with the GRITS Media Diagnostic tool (GRITS.md)

8. Support the Global Rapid Identification Tool Set (GRITS) on the cloud

3.0 - Background:

This is a new research initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:

1. The contractor shall enhance the performance of the GRITS Media Diagnostic tool (GRITS.md)
1.1 Expand the capabilities of the expert annotator to a broad spectrum of disease characteristics (e.g. symptoms, signs, findings, time, location, host, pathogen, drivers and impact)
1.2 Advance the automatic natural language processing tools to accommodate the annotation of expanded disease characteristics
1.3 Develop a GRITS ontology for infectious disease diagnostics and outbreak detection
1.4 Improve diagnostic accuracy with rigorous statistical approach to machine learning
1.5 Integrate methods from activity models and computer vision classifiers
1.6 Develop multilingual support for annotation and diagnosis.

2. The contractor shall integrate a network of experts (GRITS.net)
2.1 Build interface to GRITS web app(s) for experts (e.g. EcoHealth, Epidemico and ISID) to annotate media
2.2 Build interface into ProMED editor platform for editors to interact with the GRITS app and submit media for diagnosis
2.3 Create data filtering mechanism that uses the diagnostic tools to redirect documents to appropriate experts and/or recommend an expert
2.4 Create API for receiving requests for expertise from BSVE
2.5 Develop dialogue mechanisms for discussions with an expert
2.6 Build system for multilingual support from regional EcoHealth, Epidemico, and ProMed experts.

3. The contractor shall build capabilities for the GRITS platform to handle high-volume, real-time data feeds (GRITS.db)
3.1 Develop capacity of Kitware's Girder database to handle big data
3.2 Enhance geospatial capabilities of Girder
3.3 Develop server stack to process data for filtering and recommendation
3.4 Create infrastructure to diagnose media in a high-volume data stream
3.5 Build API for processing high-volume, real-time data to support the BSVE
3.6 Build mechanism for BSVE users to connect local datasets to GRITS.db
3.7 Formalize provenance information (W3C PROV) and standardize metadata
3.8 Generalize data hosting capabilities to support capacity to mine, diagnose, filter, prioritize, visualize, connect, and recommend data feeds for the BSVE or other platforms.

4. The contractor shall develop the geospatial capabilities of GRITS (GRITS.geo)
4.1 Develop geospatial framework for disease diagnostics (integrating WebGL, image tiles, 2D Canvas, and SVG layering)
4.2 Integrate geospatial visualization framework into the GRITS diagnostic dashboard
4.3 Build out a flexible and easy-to-use multi-dimensional visualization framework for diagnostics (integrating geographic, temporal, spatial, and disease characteristics)
4.4 Develop diagnostic geo-visualization tool for integration into the BSVE
4.5 Develop API to recommend and filter layers from EcoHealth Data Store (EcoHD)
4.6 Integrate ParaViewWeb for visualization of large datasets.

5. The contractor shall connect GRITS to the EcoHealth Global Repository of Infectious Disease Data (GRID)
5.1 Create recommendations to match media with historic disease outbreaks from GRID
5.2 Create portal in GRITS web app to the GRID community data editor
5.3 Connect GRID portfolios of historic disease media to GRITS web app
5.4 Develop API to recommend and filter historic outbreak data for BSVE.

6. The contractor shall develop global geographic and information network models and visualizations for diagnostics (GRITS.path)
6.1 Create scalable models of the geographic, ecological, and information structure of infectious disease networks for diagnostic purposes
6.2 Create interactive web visualizations of geographic, ecological, and information networks using Tangelo and D3
6.3 Develop API to connect media with geo/eco/info networks for diagnosis.

7. The contractor shall develop an interface from the BSVE that allows BSVE users to interact with the GRITS Media Diagnostic tool (GRITS.md)
7.1 Develop a robust GRITS API to receive data and return diagnoses
7.2 Build an interface to GRITS.md from BSVE for users to submit media for diagnosis
7.3 Develop interface for experts to test and improve the accuracy of the diagnoses
7.4 Develop mechanism for submitting additional training and test data
7.5 In consultation with DTRA, integrate additional components of GRITS into the BSVE interface, e.g. geo-visualizations (GRITS.geo), data recommendations (EcoHD), historic data (GRID), and expert networks (GRITS.net).

8. Support the Global Rapid Identification Tool Set (GRITS) on the cloud
8.1 Develop a software process infrastructure for the GRITS developer community
8.2 Build a robust server network to ensure uptime of the GRITS platform
8.3 Develop a test suite to identify issues and ensure compatibility with the BSVE
8.4 Develop user and developer documentation for the platform
8.5 Maintain the software via a ticketing system.

5.0 - CDRLs/Other Deliverables:

Reports

- Monthly Status Reports (6)
- Monthly Cost Status Reports (6)
- Quarterly Status Reports (2)
- Final Report (1)

Software Release Versions (V)

(V.0.9) - GRITS Interface for network of experts EcoHealth, ProMED-mail, and Healthmap (GRITS.net)
(V.1.0) - Robust Girder database backend (GRITS.db)
(V.1.1) - Advanced prototype of diagnostic app (GRITS.md)
(V.1.2) - Prototype of data recommendation and filtering powered by diagnostic app
(V.2.0) - Geospatial visualization support in GRITS app (Grits.geo)
(V.2.2) - Geospatial visualization tools for BSVE
(V.2.3) - Integrate geospatial resources into API and connect with EcoHealth Data (EcoHD)
(V.2.4) - Geospatial diagnostic dashboard
(V.3.0) - Integration with EcoHealth Global Repository of Infectious Disease Data (GRID)
(V.4.0) - Beta release of diagnostic app (GRITS.md) and API for BSVE
(V.4.1) - Enhanced natural language tagger/annotator for disease characteristics (TagV3)
(V.4.2) - Multidimensional diagnostic visualization tool
(V.5.0) - Support for processing high-volume, real time data
(V.6.0) - Deployable stand-alone GRITS web application (GRITS.web), with BSVE app extension (GRITS.app) for digital disease surveillance, visualization, diagnosis, prioritization, and filtering.

Miscellaneous data submissions:

1. Disease outbreak reports for South Asia (diagnosed and undiagnosed)
2. Global disease outbreak reports (diagnosed and undiagnosed)
3. Disease outbreaks spanning multiple sources
4. Cloud-hosted, Girder-based data store with infectious disease reports and GRITS-generated metadata.

Test results:

1. Network models (algorithms, stress tests, specificity, specificity, data types, scalability)
2. Automated data collection
3. Data storage (flat files, SQL, and NoSQL)
4. Data prioritization, filtering and visualization apps
5. Web app browser interoperability with BSVE prototype(s)
6. User experience
7. Disease diagnosis (disease types, regions, data sources).

Documentation:

1. Analyst and programmer documentation for the Global Rapid Identification Tool Set
2. User Guide for the Global Rapid Identification Tool Set to include detailed information on data

prioritization, diagnosis, filtering and visualization applications.

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)		RATING	PAGE OF PAGES 1 | 37
2. CONTRACT (Proc. Inst. Ident.) NO HDTRA1-15-C-0041	3. EFFECTIVE DATE 09 Apr 2015	4. REQUISITION/PURCHASE REQUEST/PROJECT NO J90BA14212	

5. ISSUED BY CODE HDTRA1
DEFENSE THREAT REDUCTION AGENCY/J4C
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201

6. ADMINISTERED BY (If other than item 5) CODE S0506A
DCMA GARDEN CITY
605 STEWART AVENUE
GARDEN CITY NY 11530-4761

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)
ECOHEALTH ALLIANCE INC.
MR. ALEKSEI CHMURA
460 W 34TH ST 17TH FL
NEW YORK NY 10001-2320

8. DELIVERY
[ ] FOB ORIGIN [X] OTHER (See below)

9. DISCOUNT FOR PROMPT PAYMENT

10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN — ITEM

CODE 3MMU3 FACILITY CODE

11. SHIP TO/MARK FOR CODE HDTRA1
DEFENSE THREAT REDUCTION AGENCY
SEE SEPARATE LETTER
8725 JOHN J. KINGMAN RD., MSC 6201
FORT BELVOIR VA 22060

12. PAYMENT WILL BE MADE BY CODE HQ0337
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182266
COLUMBUS OH 43218-2266

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )

14. ACCOUNTING AND APPROPRIATION DATA
See Schedule

15A. ITEM NO	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				

15G. TOTAL AMOUNT OF CONTRACT $2,217,037.00

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)
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	C	DESCRIPTION/ SPECS./ WORK STATEMENT	
X	D	PACKAGING AND MARKING	4
X	E	INSPECTION AND ACCEPTANCE	5
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	K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. [X] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 1 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
HARVEY KASDAN, CFO	(b)(6), Contracting Officer
	(b)(6) (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY (Signature of person authorized to sign)	4/9/2015	BY (b)(6) (Signature of Contracting Officer)	04/09/2015

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Previous edition is usable

STANDARD FORM 26 (REV. 12/2003)
Prescribed by GSA
FAR (48 CFR) 53.214(a)

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot		$2,217,037.00
	Base Period - PSC: AD92				
	COST				
	The Contractor shall perform the project entitled "Global Rapid Identification System (GRITS)," in accordance with Tasks 1-7 in the Statement of Work dated March 13, 2015 and incorporated into this contract as Attachment 1.				
	FOB: Destination				
	PURCHASE REQUEST NUMBER: J9CBA14212				
				ESTIMATED COST	$2,217,037.00
	ACRN AB CIN: J9CBA142120001				$2,117,486.21

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002			Lot		$0.00
	CDRLs				
	COST				
	CDRLs in accordance Exhibit A Contract Data Requirements List.				
	FOB: Destination				
				ESTIMATED COST	$0.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1001		1	Lot		$2,262,641.00
OPTION	Option I Period - PSC: AD92				
	COST				
	The Contractor shall perform the project entitled "Global Rapid Identification System (GRITS)," in accordance with Tasks 8-15 in the Statement of Work dated March 13, 2015 and incorporated into this contract as Attachment 1.				
	FOB: Destination				
				ESTIMATED COST	$2,262,641.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1002			Lot		$0.00
OPTION	CDRLs				
	COST				
	CDRLs in accordance Exhibit A Contract Data Requirements List.				
	FOB: Destination				
				ESTIMATED COST	$0.00

BAA REFERENCE

This contract is awarded as a result of HDTRA1-14-CHEM-BIO-BAA, Research and Development Broad Agency Announcement (BAA).

Section D - Packaging and Marking

CLAUSES INCORPORATED BY FULL TEXT

252.247-9001 PACKAGING AND MARKING

(a) All data contained in Exhibit A, Contract Data Requirements List (CDRL), DD Form 1423 delivered under this contract shall be delivered using best commercial practices to meet the packaging requirements of the carrier and to insure delivery, to the addressees specified on the Data Item Cover Sheet, at destination and in accordance with applicable security requirements.

(b) All data and correspondence submitted to the Contracting Officer shall reference the Contract Number, the CDRL number, and the date submitted. A copy of all correspondence sent to the Contracting Officer's Representative (COR) or Project Manager shall be simultaneously provided to the Contracting Officer.

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
0002	Destination	Government	Destination	Government
1001	Destination	Government	Destination	Government
1002	Destination	Government	Destination	Government

CLAUSES INCORPORATED BY REFERENCE

52.246-9	Inspection Of Research And Development (Short Form)	APR 1984

CLAUSES INCORPORATED BY FULL TEXT

252.246-9000 INSPECTION AND ACCEPTANCE (JUL 2007)

Government inspection and acceptance of data is specified on the Contract Data Requirements List, DD Form 1423. In accordance with FAR 52.246-9, inspection and acceptance for all work performed at any and all times under this contract shall be the responsibility of the:

__X___ Contracting Officer's Representative (COR) or Project Manager (PM). The Wide Area Work Flow (WAWF) Acceptor DoDDAC is located in DTRA 252.201-9000 *Project Manager* or DTRA 252.201-9002 *Contracting Officer's Representative.*

_____ Administrative Contracting Officer (ACO). The WAWF Acceptor DoDAAC can be found in the "Administered By" block on page 1 of the contract.

(End of Clause)

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1
0002	POP 09-APR-2015 TO 08-APR-2016	N/A	N/A FOB: Destination	
1001	POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1
1002	POP 09-APR-2016 TO 08-APR-2017	N/A	N/A FOB: Destination	

CLAUSES INCORPORATED BY REFERENCE

52.242-15 Alt I	Stop-Work Order (Aug 1989) - Alternate I	APR 1984
52.247-34	F.O.B. Destination	NOV 1991

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP CB CBA RC 1516 0400 2620 TM2DN DTRA 255
AMOUNT: $2,117,486.21
CIN J9CBA142120001: $2,117,486.21

CLAUSES INCORPORATED BY REFERENCE

52.232-33	Payment by Electronic Funds Transfer--System for Award Management	JUL 2013
252.201-7000	Contracting Officer's Representative	DEC 1991
252.204-7006	Billing Instructions	OCT 2005
252.232-7003	Electronic Submission of Payment Requests and Receiving Reports	JUN 2012
252.232-7006	Wide Area WorkFlow Payment Instructions	MAY 2013

CLAUSES INCORPORATED BY FULL TEXT

252.201-9002 CONTRACTING OFFICER'S REPRESENTATIVE (MAY 2007)

a. The Contracting Officer's Representative (COR) for this contract is:
__X__ SEE SEPARATE LETTER

____ _____
Defense Threat Reduction Agency/_____
1680 Texas St SE
Kirtland AFB NM 87117-5669
Telephone number (505) ___-____
e-mail address_____@abq.dtra.mil.
WAWF Acceptor DoDAAC: HDTRA2

b. The COR will act as the Contracting Officer's Representative for technical matters providing technical direction and discussion as necessary with respect to the specification/statement of work and monitoring the progress and quality of the Contractor's performance. The COR is NOT an Administrative Contracting Officer (ACO) and does not have the authority to take any action, either directly or indirectly that would change the pricing, quality, quantity, place of performance, delivery schedule, or any other terms and conditions of the contract, or to direct the accomplishment of effort, which goes beyond the scope of the specifications/statement of work in the contract.

c. When, in the opinion of the contractor, the COR requests effort outside the existing scope of the contract, the contractor shall promptly notify the Contracting Officer in writing. No action shall be taken by the contractor under such direction until the Contracting Officer has issued a modification to the contract or has otherwise resolved the issue.

252.204-9002 PAYMENT INSTRUCTIONS FOR MULTIPLE ACCOUNTING CLASSIFICATION CITATIONS (MAY 2012)

In accordance with DFARS 204.7108 Payment Instructions, payment shall be made by the numbered payment instruction identified below:

Line item specific: sequential ACRN order.
252.204-0002 Line Item Specific: Sequential ACRN Order. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment in sequential ACRN order within the line item, exhausting all funds in the previous ACRN before paying from the next ACRN using the following sequential order: Alpha/Alpha; Alpha/Numeric; Numeric/Alpha; and Numeric/Numeric.

CLAUSES INCORPORATED BY FULL TEXT

252.216-9005 PROFIT OR FEE ON TRAVEL COSTS (JUL 2008)

Travel shall not be a profit or fee bearing cost element.

(End of clause)

CLAUSES INCORPORATED BY FULL TEXT

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,117,486.21 is obligated for work to be performed during the period beginning with contract award and continuing through the end of the base period. Additional incremental funding planned, but not obligated, is: $99,551.79.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed $_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of $_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of S_____C_____. Within this amount (S_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

Fill in the dollar amounts as applicable:

CLIN 0001

A: S2,217,037.00
B: $0
C: S2,117,486.21

252.232-9012 WIDE AREA WORK FLOW (WAWF) – RECEIPT AND ACCEPTANCE (RA) INSTRUCTIONS (November 2011)

(a) As prescribed in DFARS clause 252.232-7003 Electronic Submission of Payment Requests (Jan 2004), Contractors must submit payment requests in electronic form. Paper copies will no longer be accepted or processed for payment unless the conditions of DFARS clause 252.232-7003(c) apply. To facilitate this electronic submission, the Defense Threat Reduction Agency (DTRA) has implemented the DoD sanctioned Wide Area Workflow-Receipt and Acceptance (WAWF-RA) for contractors to submit electronic payment requests and receiving reports. The contractor shall submit electronic payment requests and receiving reports via WAWF-RA. **Vendors shall send an email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract by clicking on the Send Additional Email Notifications link upon every submission of an invoice/cost voucher in WAWF-RA. To access WAWF, go to https://wawf.eb.mil.**

**** For questions, contact the DTRA WAWF Team at wawfhelp@dtra.mil ****

(b) Definitions:

Acceptor: Contracting Officer's Representative, Program/Project Manager, or other government acceptance official as identified in the contract/order.

Pay Official: Defense Finance and Accounting Service (DFAS) payment office identified in the contract/order.

SHIP To/Service Acceptor DoDAAC: Acceptor DoDAAC or DCMA DoDAAC (as specified in the contract/order).

DCAA Auditor DoDAAC: Needed when invoicing on cost-reimbursable contracts. (Go to www.dcaa.mil and click on the appropriate link under the Audit Office Locator to search for your DCAA DoDAAC.)

>>>>> For contracts that are administered by the **Office of Naval Research (ONR)**: <<<<<
Enter the ONR DoDAAC in the DCAA Auditor DoDAAC field in WAWF.

(c) WAWF Contractor Input Information:

The contractor shall use the following information in creating electronic payment requests in WAWF:

Invoice Type in WAWF:

If billing for Cost Type/Reimbursable contracts (including T&M and LH), select "Cost Voucher"
If billing for Firm-Fixed Price (FFP) Materials Only, select "Combo"
If billing for FFP Materials and Service, select "Combo"
If billing for FFP Services Only, select "2-n-1 (Services Only)"

** If the contract contains both FFP and Cost Type (including T&M and LH) line items, they must be invoiced separately on appropriate types mentioned above. Upon the written approval of the Project Manager or Contracting Officer's Representative, the contractor may invoice both line items in one type of invoice.

For WAWF Routing Information, See Table Below:

Description	SF 26	SF 33	SF 1449	DD 1155
	Located in Block/Section			
Contract Number	2	2	2	1
Delivery Order	See Individual Order		4	2
CAGE Code	7	15a	17a	9
Pay DoDAAC	12	25	18a	15
Inspection	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Acceptance	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Issue Date	3	5	3	3
Issue By DoDAAC	5	7	9	6
Admin DoDAAC	6	24	16	7
Ship To / Service Acceptor DoDAAC	6	24	16	7
Ship to Extension	Do Not Fill In			
Services or Supplies	Based on majority of requirement as determined by monetary value			
Final Invoice?	Do not change "N" (no) to "Y" (yes) unless this is the last invoice and the contract is ready for closeout.			

(d) Final Invoices/Vouchers -Final Payment shall be made in accordance with the Federal Acquisition Regulation (FAR) 52.216-7, entitled "Allowable Cost and Payment."

Invoices - Invoice 2-n-1 (Services Only) and Invoice and Receiving Report (Combo)
Select the ***"Y"*** selection from the ***"Final Invoice?"*** drop-down box when submitting the final invoice for payment for a contract. Upon successful submission of the final invoice, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract.

Cost Vouchers - Once the final DCAA audit is complete for cost reimbursable contracts and authorization is received to submit the final cost voucher, select the ***"Y"*** selection from the ***"Final Voucher"*** drop-down box when submitting the final cost voucher. Upon successful submission of the final cost voucher, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the following email address: finalcostvouchers@dtra.mil

(e) WAWF Training may be accessed online at http://www.wawftraining.com. To practice creating documents in WAWF, visit the practice site at https://wawftraining.eb.mil. General DFAS information may be accessed using the DFAS website at http://www.dfas.mil/. Payment status information may be accessed using the myInvoice system at https://myinvoice.csd.disa.mil. Your contract number and shipment/invoice number will be required to check status of your payment.

Note: For specific invoice related inquiries email: vendorpay@dtra.mil. Vendors shall forward any additional DTRA related WAWF questions to wawfhelp@dtra.mil.

252.242-9003 - ASSIGNMENT OF CONTRACT ADMINISTRATION SERVICES (CAS) FUNCTIONS (FEB 2012)

a. The contract administration functions stated in FAR 42.302(a) are assigned to: See Page 1, Section A, Block 6 of this contract.

b. Notwithstanding that assignment, in accordance with FAR 42.202(b)(2), the following functions are determined to be best performed by the PCO and are retained by the DTRA Contracting Office:

(1) FAR 42.302(a)(3) Conduct post-award orientation conferences.

(2) FAR 42.302(a)(20) Ensure processing and execution of duty-free entry certificates.

(3) FAR 42.302(a)(40) Perform engineering surveillance to assess compliance with contractual terms for schedule, cost, and technical performance in the areas of design, development, and production.

(4) FAR 42.302(a)(51) Consent to the placement of subcontracts.

(5) Approval or disapproval of the data items listed on Exhibit A, DD Form 1423, Contract Data Requirements List.

(END OF CLAUSE)

Section H - Special Contract Requirements

CLAUSES INCORPORATED BY FULL TEXT

252.201-9003 LIMITATION OF AUTHORITY (JUN 2009)

No person in the Government, other than a Contracting Officer, has the authority to provide direction to the Contractor, which alters the Contractor's obligations or changes this contract in any way. If any person representing the Government, other than a Contracting Officer, attempts to alter contract obligations, change the contract specifications/statement of work or tells the contractor to perform some effort which the Contractor believes to be outside the scope of this contract, the Contractor shall immediately notify the Procuring Contracting Officer (PCO). Contractor personnel shall not comply with any order or direction which they believe to be outside the scope of this contract unless the order or direction is issued by a Contracting Officer.

CLAUSES INCORPORATED BY FULL TEXT

252.203-9000 Prohibition on the Use of Senior Mentors (JUNE 2010)

(a) The use of senior mentors by the Defense Threat Reduction Agency (DTRA) enhances the readiness of the Agency across a wide range of strategic, operational, joint, functional, technical, management and development mission areas. The relevant prior service, joint force experience, and unique expertise of these senior consultants provide senior leadership with valuable insights and contribute to the continuous improvement of the Agencies' operations.

(b) For the purposes of this clause, Senior Mentor is defined as a retired flag, general or other military officers (O-6) or retired senior civilian official (Senior Executive Service (SES), Senior Level (SL), Scientific and Professional (ST)) who provides expert experience-based mentoring, teaching, training, advice, and recommendations to senior military officers, staffs and students as they participate in war games, warfighting courses, operational planning, operational exercises, and decision-making exercises.

(c) In accordance with Secretary of Defense Memorandum entitled "Policy on Senior Mentors" dated April 1, 2010, DTRA will hire all senior mentors as highly qualified experts (HQE) under 5 U.S.C. 9903. This policy balances the need for DTRA to secure the specialized knowledge required for these operational exercises with the need to hire such experts in a manner that promotes public trust and confidence.

(d) The Contractor shall not include the use of senior mentors in bids or proposals for services/supplies offered to DTRA.

(e) The Contractor shall include the substance of this clause in all subcontracts.

(End of Clause)

CLAUSES INCORPORATED BY FULL TEXT

252.209-9002 NON-GOVERNMENT SUPPORT PERSONNEL (JAN 2008)

The following companies may have access to contractor information, technical data or computer software that may be marked as proprietary or otherwise marked with restrictive legends: JAB Solutions (Contract Specialist support); Quanterion Solutions, Inc. (DTRIAC Technical Engineering Services); Booz Allen Hamilton (administrative support); TASC (advisory and assistance services); Kforce Government Solutions, Inc. (Accounting and Financial Systems Support). Each contract contains organizational conflict of interest provisions and/or includes contractual requirements for non-disclosure of proprietary contractor information or data/software marked with restrictive legends. The contractor, by submitting a proposal or entering into this contract, is deemed to have consented to the disclosure of its information to JAB Solutions, Quanterion Solutions, Inc., Booz Allen Hamilton, TASC, and Kforce Government Solutions, Inc. under the conditions and limitations described herein.

CLAUSES INCORPORATED BY FULL TEXT

252.215-9004 KEY PERSONNEL (AUG 2012)

The personnel listed below are considered essential to the work being performed hereunder. Prior to removing, replacing, or diverting any of the specified individuals, the Contractor shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this Contract. No deviation shall be made by the Contractor without the prior written consent of the Contracting Officer; provided, that the Contracting Officer authorizes in writing the change, such authorization shall constitute the consent of the Contracting Officer required by this paragraph. The personnel listed below may, with the consent of the contracting parties, be amended from time to time during the course of the Contract to either add or delete personnel as appropriate.

Principal Investigator

CLAUSES INCORPORATED BY FULL TEXT

252.216-9003 CONSULTANTS (OCT 1998)

Services of consultants shall be at rates and for periods approved in advance by the Contracting Officer. Requests for approval shall be submitted to the Contracting Officer sufficiently in advance of the need to use a consultant under this Contract. The request shall include (a) a copy of the proposed consultant agreement, (b) a brief biography of the consultant, and (c) an indication of the area(s) in which consultant's expertise will be utilized and why it is essential for contract performance. In addition, significant deviations from the dollar amount approved for consultant services, or changes in the consultants to be utilized, must likewise be approved in advance upon submission of adequate justification.

CLAUSES INCORPORATED BY FULL TEXT

252.223-9004 – Environmental, Radiation, Safety Notification, Compliance and Liability (JUN 2013)

(a) Environmental, Radiation, and Safety Notification: The Contractor shall notify the Contracting Officer (CO) and Contracting Officer Representative (COR) of any occurrence of non-compliance with Environmental, Radiation, and Safety regulations that occur at any of the Contractor's facilities at which government property is located as soon as practicable, but not later than 24 hours after identification of an incident. The Contractor shall make initial notification by telephone or email. Then, shall follow-up with a written report within 10 business days.

(b) The Contractor shall notify the CO/COR of any external Environmental, Radiation, and Safety audits or inspections conducted at the facility and provide any reports resulting from the audit. The final report shall be provided to the CO/COR within 30 days following the audit.

(c) The Contractor shall comply with all Federal, State, and local Environmental, Radiation, and Safety regulations, including, without limitation, statutes, ordinances, court orders, consent decrees, administrative orders, or compliance agreements applicable to the facilities where the Government Property is located.

(d) The Contractor shall acquire all necessary permits, and licenses.

(e) DTRA will not be responsible, financially or otherwise, for the investigation, monitoring, cleanup, containment, restoration, removal, or other remedial activity with respect to any hazardous substances present in the soil, ground water, or building(s) that (i) results from activities conducted by entities other than DTRA during the term of this contract, or (ii) results from activities conducted pursuant to any contract, lease, or occupancy agreement that is not associated with DTRA-owned property or activities.

(End of Clause)

CLAUSES INCORPORATED BY FULL TEXT

252.235-9000 SOURCES OF INFORMATION (JULY 2000)

a. The results of the research to be delivered to the Government under this Contract shall embody the most recent reliable information in the field which is available to the Contractor from private and governmental sources, and the Contractor agrees to utilize all sources of such information available to it. In this connection, information in this field which is in the control of DTRA shall, with the consent of the Contracting Officer's Representative (COR) and under such safeguards and procedures as he/she may prescribe, be made available to the Contractor on request. Additionally, the Contractor is encouraged to make use of the resources available through the Defense Threat Reduction Information Analysis Center (DTRIAC), 1680 Texas Street, Southeast, Kirtland AFB, New Mexico 87117.

b. Reasonable assistance in obtaining access to information, or in obtaining permission to use Government or private facilities, will be given to the Contractor by DTRA. Specifically, the Contractor must register with the Defense Technical Information Center, ATTN: DTIC, 8725 John J. Kingman Road, Suite 0944, Fort Belvoir, VA 22060-6218, in accordance with Defense Logistics Agency (DLA) Regulation 4185.10, Certification and Registration for Access to DoD Defense Technical Information. DD Form 1540, the registration form, shall be forwarded to the DTRA Contracting Officer for approval (DFARS 35.010(b)).
(End of clause)

CLAUSES INCORPORATED BY FULL TEXT

252.237-9001 - Enterprise-wide Contractor Manpower Reporting Application (APR 2013)

(a) In accordance with Section 2330a of title 10, United States Code (10 USC 2330a), Contractors shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract via a secure data collection site. The contractor shall completely fill in all required data fields using the following web address: http://www.ecmra.mil/.

(b) Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the help desk at: http://www.ecmra.mil.

(End of Clause)

252.242-9000 CONTRACTOR PERFORMANCE ASSESSMENT REPORTING SYSTEM (CPARS) (NOV 2002)

1. As required by FAR Part 42.1503, and DTRA policy for the Contractor Performance Assessment Reporting System (CPARS) and Past Performance Automated Information System (PPAIS) effective July, 2001, the Government shall complete a CPAR each year of the period of performance of this contract. The contractor will have an opportunity to provide their comments in each CPAR before it is finalized. In accordance with DTRA CPARS policy the completed CPARs will be entered into the Department of Defense Past Performance Automated Information System (PPAIS), a retrieval system for source selection teams to access the CPARs of contractors' performance. The DTRA CPARS and PPAIS policy includes an explanation of the process and procedures that will be utilized under this contract. A copy is available for contractor reference via the DTRAlink (www.dtra.mil) by accessing Acquisition, How We Do Business.

2. The CPARs shall occur annually in accordance with the schedule established below:

(i) Initial CPAR: 12 months after contract start date (date performance begins)
TBD (by PCO)

(ii) Interim CPAR(s) will be performed annually on the anniversary of the contract start date according to the following schedule:
TBD (by PCO)

(iii) A Final CPAR will be completed upon contract termination, transfer of program management/contract management responsibility outside of DTRA, the delivery of the final end item on contract and/or the completion of the performance period.

(iv) An Out-of-Cycle CPAR may be required when there is a significant change in performance that alters the assessment in one or more evaluation area(s). An Out-of-Cycle CPAR is optional and shall be processed in accordance with Attachment___

3. Each CPAR shall only cover the period elapsing from the last annual CPAR. The final CPAR shall not be used to summarize or "roll-up" the contractor's performance under the entire contract. Each annual CPAR and the final CPAR together will comprise a total picture of contractor performance.

4. At the request of the Government, a verbal, informal review of the Contractor's performance may be held 3-6 months before the completion of the Interim or Final Evaluation periods. This review entails discussing any problems or areas of concern regarding the Contractor's performance to date. No written evaluation form or other formal documentation is required for this evaluation. It may be conducted with the Contractor by telephone, teleconference or face-to-face. This is designed to offer the Contractor an opportunity to correct known deficiencies or weaknesses prior to the formal written evaluation.

5. As set forth in DTRA CPARS policy, any disagreements between the Contractor and the Program Manager regarding the CPAR(s) that cannot be resolved shall be reviewed by the designated Reviewing Official prior to finalization of the CPAR.

6. Special Requirements for Indefinite Delivery Contracts (IDIQ and Requirements type), CPARs shall be processed (select one)

____ for all existing orders (combined) at the time the CPAR is processed

____ on an order-by-order basis

____ on a grouped order basis

7. The policy and procedures set forth in this clause and DTRA CPARS policy are not subject to "Disputes" as described in FAR Part 33.

Section I - Contract Clauses

UPDATED CLAUSES

52.222-50 COMBATING TRAFFICKING IN PERSONS (MAR 2015)
52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (MAR 2015)
252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A COUNTRY THAT IS A STATE SPONSOR OF TERRORISM (DEC 2014)

CLAUSES INCORPORATED BY REFERENCE

52.202-1	Definitions	NOV 2013
52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	MAY 2014
52.203-6	Restrictions On Subcontractor Sales To The Government	SEP 2006
52.203-7	Anti-Kickback Procedures	MAY 2014
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	MAY 2014
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	MAY 2014
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	OCT 2010
52.203-17	Contractor Employee Whistleblower Rights and Requirement To Inform Employees of Whistleblower Rights	APR 2014
52.204-4	Printed or Copied Double-Sided on Postconsumer Fiber Content Paper	MAY 2011
52.204-10	Reporting Executive Compensation and First-Tier Subcontract Awards	JUL 2013
52.204-13	System for Award Management Maintenance	JUL 2013
52.204-18	Commercial and Government Entity Code Maintenance	NOV 2014
52.204-19	Incorporation by Reference of Representations and Certifications.	DEC 2014
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	AUG 2013
52.209-9	Updates of Publicly Available Information Regarding Responsibility Matters	JUL 2013
52.209-10	Prohibition on Contracting With Inverted Domestic Corporations	DEC 2014
52.215-2	Audit and Records--Negotiation	OCT 2010
52.215-2 Alt II	Audit and Records--Negotiation (Oct 2010) - Alternate II	APR 1998
52.215-8	Order of Precedence--Uniform Contract Format	OCT 1997
52.215-10	Price Reduction for Defective Certified Cost or Pricing Data	AUG 2011
52.215-12	Subcontractor Certified Cost or Pricing Data	OCT 2010
52.215-14	Integrity of Unit Prices	OCT 2010
52.215-15	Pension Adjustments and Asset Reversions	OCT 2010
52.215-17	Waiver of Facilities Capital Cost of Money	OCT 1997
52.215-18	Reversion or Adjustment of Plans for Postretirement Benefits (PRB) Other than Pensions	JUL 2005
52.215-19	Notification of Ownership Changes	OCT 1997
52.215-21	Requirements for Certified Cost or Pricing Data and Data Other Than Certified Cost or Pricing Data -- Modifications	OCT 2010
52.215-23	Limitations on Pass-Through Charges	OCT 2009
52.216-11	Cost Contract--No Fee	APR 1984

52.219-8	Utilization of Small Business Concerns	OCT 2014
52.219-9 ALT II (Dev)	Small Business Subcontracting Plan (Deviation 2013-O0014) - Alternate II	OCT 2014
52.219-16	Liquidated Damages-Subcontracting Plan	JAN 1999
52.222-3	Convict Labor	JUN 2003
52.222-21	Prohibition Of Segregated Facilities	FEB 1999
52.222-26	Equal Opportunity	MAR 2007
52.222-35	Equal Opportunity for Veterans	JUL 2014
52.222-36	Equal Opportunity for Workers with Disabilities	JUL 2014
52.222-37	Employment Reports on Veterans	JUL 2014
52.222-40	Notification of Employee Rights Under the National Labor Relations Act	DEC 2010
52.222-54	Employment Eligibility Verification	AUG 2013
52.223-6	Drug-Free Workplace	MAY 2001
52.223-18	Encouraging Contractor Policies To Ban Text Messaging While Driving	AUG 2011
52.225-13	Restrictions on Certain Foreign Purchases	JUN 2008
52.227-1 Alt I	Authorization And Consent (Dec 2007) - Alternate I	APR 1984
52.227-2	Notice And Assistance Regarding Patent And Copyright Infringement	DEC 2007
52.227-11 Alt II	Patent Rights--Ownership by the Contractor (May 2014) - Alternate II	DEC 2007
52.228-7	Insurance--Liability To Third Persons	MAR 1996
52.232-9	Limitation On Withholding Of Payments	APR 1984
52.232-17	Interest	MAY 2014
52.232-20	Limitation Of Cost	APR 1984
52.232-22	Limitation Of Funds	APR 1984
52.232-23 Alt I	Assignment of Claims (May 2014) - Alternate I	APR 1984
52.232-25 Alt I	Prompt Payment (July 2013) Alternate I	FEB 2002
52.232-39	Unenforceability of Unauthorized Obligations	JUN 2013
52.232-40	Providing Accelerated Payments to Small Business Subcontractors	DEC 2013
52.233-1 Alt I	Disputes (May 2014) - Alternate I	DEC 1991
52.233-3 Alt I	Protest After Award (Aug 1996) - Alternate I	JUN 1985
52.233-4	Applicable Law for Breach of Contract Claim	OCT 2004
52.242-1	Notice of Intent to Disallow Costs	APR 1984
52.242-3	Penalties for Unallowable Costs	MAY 2014
52.242-4	Certification of Final Indirect Costs	JAN 1997
52.242-13	Bankruptcy	JUL 1995
52.243-2 Alt V	Changes--Cost-Reimbursement (Aug 1987) - Alternate V	APR 1984
52.244-5	Competition In Subcontracting	DEC 1996
52.245-1	Government Property	APR 2012
52.245-9	Use And Charges	APR 2012
52.246-25	Limitation Of Liability--Services	FEB 1997
52.249-5	Termination For Convenience Of The Government (Educational And Other Nonprofit Institutions)	SEP 1996
52.251-1	Government Supply Sources	APR 2012
52.253-1	Computer Generated Forms	JAN 1991
252.203-7000	Requirements Relating to Compensation of Former DoD Officials	SEP 2011
252.203-7001	Prohibition On Persons Convicted of Fraud or Other Defense-Contract-Related Felonies	DEC 2008
252.203-7002	Requirement to Inform Employees of Whistleblower Rights	SEP 2013
252.204-7000	Disclosure Of Information	AUG 2013

252.204-7003	Control Of Government Personnel Work Product	APR 1992
252.204-7012	Safeguarding of Unclassified Controlled Technical Information	NOV 2013
252.205-7000	Provision Of Information To Cooperative Agreement Holders	DEC 1991
252.211-7007	Reporting of Government-Furnished Property	AUG 2012
252.215-7000	Pricing Adjustments	DEC 2012
252.215-7002	Cost Estimating System Requirements	DEC 2012
252.219-7003	Small Business Subcontracting Plan (DOD Contracts)	OCT 2014
252.222-7006	Restrictions on the Use of Mandatory Arbitration Agreements	DEC 2010
252.225-7012	Preference For Certain Domestic Commodities	FEB 2013
252.225-7048	Export-Controlled Items	JUN 2013
252.226-7001	Utilization of Indian Organizations and Indian-Owned Economic Enterprises, and Native Hawaiian Small Business Concerns	SEP 2004
252.227-7013	Rights in Technical Data--Noncommercial Items	FEB 2014
252.227-7014	Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation	FEB 2014
252.227-7016	Rights in Bid or Proposal Information	JAN 2011
252.227-7019	Validation of Asserted Restrictions--Computer Software	SEP 2011
252.227-7027	Deferred Ordering Of Technical Data Or Computer Software	APR 1988
252.227-7030	Technical Data--Withholding Of Payment	MAR 2000
252.227-7037	Validation of Restrictive Markings on Technical Data	JUN 2013
252.227-7039	Patents--Reporting Of Subject Inventions	APR 1990
252.231-7000	Supplemental Cost Principles	DEC 1991
252.232-7010	Levies on Contract Payments	DEC 2006
252.235-7011	Final Scientific or Technical Report	NOV 2004
252.242-7006	Accounting System Administration	FEB 2012
252.243-7002	Requests for Equitable Adjustment	DEC 2012
252.244-7000	Subcontracts for Commercial Items	JUN 2013
252.244-7001	Contractor Purchasing System Administration	MAY 2014
252.245-7001	Tagging, Labeling, and Marking of Government-Furnished Property	APR 2012
252.245-7002	Reporting Loss of Government Property	APR 2012
252.245-7003	Contractor Property Management System Administration	APR 2012
252.245-7004	Reporting, Reutilization, and Disposal	MAY 2013
252.247-7023	Transportation of Supplies by Sea	APR 2014
252.247-7024	Notification Of Transportation Of Supplies By Sea	MAR 2000
252.251-7000	Ordering From Government Supply Sources	AUG 2012

CLAUSES INCORPORATED BY FULL TEXT

52.216-7 ALLOWABLE COST AND PAYMENT (JUN 2013)

(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but (except for small business concerns) not more often than once every 2 weeks, in amounts determined to be allowable by the Contracting Officer in accordance with Federal Acquisition Regulation (FAR) subpart 31.2 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25.

(3) The designated payment office will make interim payments for contract financing on the 30th day after the designated billing office receives a proper payment request.

In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs. (1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (b)(2) of the clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made--

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of financing payments that have been paid by cash, check, or other forms of payment to subcontractors.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates. (1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(iii) An adequate indirect cost rate proposal shall include the following data unless otherwise specified by the cognizant Federal agency official:

(A) Summary of all claimed indirect expense rates, including pool, base, and calculated indirect rate.

(B) General and Administrative expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts).

(C) Overhead expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) for each final indirect cost pool.

(D) Occupancy expenses (intermediate indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) and expense reallocation to final indirect cost pools.

(E) Claimed allocation bases, by element of cost, used to distribute indirect costs.

(F) Facilities capital cost of money factors computation.

(G) Reconciliation of books of account (i.e., General Ledger) and claimed direct costs by major cost element.

(H) Schedule of direct costs by contract and subcontract and indirect expense applied at claimed rates, as well as a subsidiary schedule of Government participation percentages in each of the allocation base amounts.

(I) Schedule of cumulative direct and indirect costs claimed and billed by contract and subcontract.

(J) Subcontract information. Listing of subcontracts awarded to companies for which the contractor is the prime or upper-tier contractor (include prime and subcontract numbers; subcontract value and award type; amount claimed during the fiscal year; and the subcontractor name, address, and point of contact information).

(K) Summary of each time-and-materials and labor-hour contract information, including labor categories, labor rates, hours, and amounts; direct materials; other direct costs; and, indirect expense applied at claimed rates.

(L) Reconciliation of total payroll per IRS form 941 to total labor costs distribution.

(M) Listing of decisions/agreements/approvals and description of accounting/organizational changes.

(N) Certificate of final indirect costs (see 52.242-4,
Certification of Final Indirect Costs).

(O) Contract closing information for contracts physically completed in this fiscal year (include contract number, period of performance, contract ceiling amounts, contract fee computations, level of effort, and indicate if the contract is ready to close).

(iv) The following supplemental information is not required to determine if a proposal is adequate, but may be required during the audit process:

(A) Comparative analysis of indirect expense pools detailed by account to prior fiscal year and budgetary data.

(B) General organizational information and limitation on allowability of compensation for certain contractor personnel. See 31.205-6(p). Additional salary reference information is available at http://www.whitehouse.gov/omb/procurement_index_exec_comp/.

(C) Identification of prime contracts under which the contractor performs as a subcontractor.

(D) Description of accounting system (excludes contractors required to submit a CAS Disclosure Statement or contractors where the description of the accounting system has not changed from the previous year's submission).

(E) Procedures for identifying and excluding unallowable costs from the costs claimed and billed (excludes contractors where the procedures have not changed from the previous year's submission).

(F) Certified financial statements and other financial data (e.g., trial balance, compilation, review, etc.).

(G) Management letter from outside CPAs concerning any internal control weaknesses.

(H) Actions that have been and/or will be implemented to correct the weaknesses described in the management letter from subparagraph G) of this section.

(I) List of all internal audit reports issued since the last disclosure of internal audit reports to the Government.

(J) Annual internal audit plan of scheduled audits to be performed in the fiscal year when the final indirect cost rate submission is made.

(K) Federal and State income tax returns.

(L) Securities and Exchange Commission 10-K annual report.

(M) Minutes from board of directors meetings.

(N) Listing of delay claims and termination claims submitted which contain costs relating to the subject fiscal year.

(O) Contract briefings, which generally include a synopsis of all pertinent contract provisions, such as: Contract type, contract amount, product or service(s) to be provided, contract performance period, rate ceilings, advance approval requirements, pre-contract cost allowability limitations, and billing limitations.

(v) The Contractor shall update the billings on all contracts to reflect the final settled rates and update the schedule of cumulative direct and indirect costs claimed and billed, as required in paragraph (d)(2)(iii)(I) of this section, within 60 days after settlement of final indirect cost rates.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates. The completion invoice or voucher shall include settled subcontract amounts and rates. The prime contractor is responsible for settling subcontractor amounts and rates included in the completion invoice or voucher and providing status of subcontractor audits to the contracting officer upon request.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may--

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) Adjusted for prior overpayments or underpayments.

(h) Final payment. (1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(5) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts

are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.216-7 ALLOWABLE COST AND PAYMENT (JUN 2013) -- ALTERNATE IV (AUG 2012)
(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but not more often than once every two weeks, in amounts determined to be allowable by the Contracting Officer in accordance with FAR subpart 31.7 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25.

(3) The designated payment office will make interim payments for contract financing on the 30th day after the designated billing office receives a proper payment request.

In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs. (1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (b)(2) of the clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made--

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of financing payments that have been paid by cash, check, or other forms of payment to subcontractors.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates. (1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(iii) An adequate indirect cost rate proposal shall include the following data unless otherwise specified by the cognizant Federal agency official:

(A) Summary of all claimed indirect expense rates, including pool, base, and calculated indirect rate.

(B) General and Administrative expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts).

(C) Overhead expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) for each final indirect cost pool.

(D) Occupancy expenses (intermediate indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) and expense reallocation to final indirect cost pools.

(E) Claimed allocation bases, by element of cost, used to distribute indirect costs.

(F) Facilities capital cost of money factors computation.

(G) Reconciliation of books of account (i.e., General Ledger) and claimed direct costs by major cost element.

(H) Schedule of direct costs by contract and subcontract and indirect expense applied at claimed rates, as well as a subsidiary schedule of Government participation percentages in each of the allocation base amounts.

(I) Schedule of cumulative direct and indirect costs claimed and billed by contract and subcontract.

(J) Subcontract information. Listing of subcontracts awarded to companies for which the contractor is the prime or upper-tier contractor (include prime and subcontract numbers; subcontract value and award type; amount claimed during the fiscal year; and the subcontractor name, address, and point of contact information).

(K) Summary of each time-and-materials and labor-hour contract information, including labor ategories, labor rates, hours, and amounts; direct materials; other direct costs; and, indirect expense applied at claimed rates.

(L) Reconciliation of total payroll per IRS form 941 to total labor costs distribution.

(M) Listing of decisions/agreements/approvals and description of accounting/organizational changes.

(N) Certificate of final indirect costs (see 52.242-4,
Certification of Final Indirect Costs).

(O) Contract closing information for contracts physically completed in this fiscal year (include contract number, period of performance, contract ceiling amounts, contract fee computations, level of effort, and indicate if the contract is ready to close).

(iv) The following supplemental information is not required to determine if a proposal is adequate, but may be required during the audit process:

(A) Comparative analysis of indirect expense pools detailed by account to prior fiscal year and budgetary data.
(B) General organizational information and limitation on allowability of compensation for certain contractor personnel. See 31.205-6(p). Additional salary reference information is available at http://www.whitehouse.gov/omb/procurement_index_exec_comp/.

(C) Identification of prime contracts under which the contractor performs as a subcontractor.

(D) Description of accounting system (excludes contractors required to submit a CAS Disclosure Statement or contractors where the description of the accounting system has not changed from the previous year's submission).

(E) Procedures for identifying and excluding unallowable costs from the costs claimed and billed (excludes contractors where the procedures have not changed from the previous year's submission).

(F) Certified financial statements and other financial data (e.g., trial balance, compilation, review, etc.).

(G) Management letter from outside CPAs concerning any internal control weaknesses.

(H) Actions that have been and/or will be implemented to correct the weaknesses described in the management letter from subparagraph G) of this section.

(I) List of all internal audit reports issued since the last disclosure of internal audit reports to the Government.

(J) Annual internal audit plan of scheduled audits to be performed in the fiscal year when the final indirect cost rate submission is made.

(K) Federal and State income tax returns.

(L) Securities and Exchange Commission 10-K annual report.

(M) Minutes from board of directors meetings.

(N) Listing of delay claims and termination claims submitted which contain costs relating to the subject fiscal year.

(O) Contract briefings, which generally include a synopsis of all pertinent contract provisions, such as: Contract type, contract amount, product or service(s) to be provided, contract performance period, rate ceilings, advance approval requirements, pre-contract cost allowability limitations, and billing limitations.

(v) The Contractor shall update the billings on all contracts to reflect the final settled rates and update the schedule of cumulative direct and indirect costs claimed and billed, as required in paragraph (d)(2)(iii)(I) of this section, within 60 days after settlement of final indirect cost rates.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates. The completion invoice or voucher shall include settled subcontract amounts and rates. The prime contractor is responsible for settling subcontractor amounts and rates

included in the completion invoice or voucher and providing status of subcontractor audits to the contracting officer upon request.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may--

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) Adjusted for prior overpayments or underpayments.

(h) Final payment. (1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(5) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)

(a) The Government may extend the term of this contract by written notice to the Contractor prior to the end of the Base Period; provided that the Government gives the Contractor a preliminary written notice of its intent to extend at least 30 days before the contract expires. The preliminary notice does not commit the Government to an extension.

(b) If the Government exercises this option, the extended contract shall be considered to include this option clause.

(c) The total duration of this contract, including the exercise of any options under this clause, shall not exceed 24 months.

(End of clause)

52.219-28 POST-AWARD SMALL BUSINESS PROGRAM REREPRESENTATION (JULY 2013)

(a) Definitions. As used in this clause--

Long-term contract means a contract of more than five years in duration, including options. However, the term does not include contracts that exceed five years in duration because the period of performance has been extended for a cumulative period not to exceed six months under the clause at 52.217-8, Option to Extend Services, or other appropriate authority.

Small business concern means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR part 121 and the size standard in paragraph (c) of this clause. Such a concern is ``not dominant in its field of operation'' when it does not exercise a controlling or major influence on a national basis in a kind of business activity in which a number of business concerns are primarily engaged. In determining whether dominance exists, consideration shall be given to all appropriate factors, including volume of business, number of employees, financial resources, competitive status or position, ownership or control of materials, processes, patents, license agreements, facilities, sales territory, and nature of business activity.

(b) If the Contractor represented that it was a small business concern prior to award of this contract, the Contractor shall rerepresent its size status according to paragraph (e) of this clause or, if applicable, paragraph (g) of this clause, upon the occurrence of any of the following:

(1) Within 30 days after execution of a novation agreement or within 30 days after modification of the contract to include this clause, if the novation agreement was executed prior to inclusion of this clause in the contract.

(2) Within 30 days after a merger or acquisition that does not require a novation or within 30 days after modification of the contract to include this clause, if the merger or acquisition occurred prior to inclusion of this clause in the contract.

(3) For long-term contracts--

(i) Within 60 to 120 days prior to the end of the fifth year of the contract; and

(ii) Within 60 to 120 days prior to the date specified in the contract for exercising any option thereafter.

(c) The Contractor shall rerepresent its size status in accordance with the size standard in effect at the time of this rerepresentation that corresponds to the North American Industry Classification System (NAICS) code assigned to this contract. The small business size standard corresponding to this NAICS code can be found at http://www.sba.gov/content/table-small-business-size-standards.

(d) The small business size standard for a Contractor providing a product which it does not manufacture itself, for a contract other than a construction or service contract, is 500 employees.

(e) Except as provided in paragraph (g) of this clause, the Contractor shall make the representation required by paragraph (b) of this clause by validating or updating all its representations in the Representations and Certifications section of the System for Award Management (SAM) and its other data in SAM, as necessary, to ensure that they reflect the Contractor's current status. The
Contractor shall notify the contracting office in writing within the timeframes specified in paragraph (b) of this clause that the data have been validated or updated, and provide the date of the validation or update.

(f) If the Contractor represented that it was other than a small business concern prior to award of this contract, the Contractor may, but is not required to, take the actions required by paragraphs (e) or (g) of this clause.

(g) If the Contractor does not have representations and certifications in SAM, or does not have a representation in SAM for the NAICS code applicable to this contract, the Contractor is required to complete the following rerepresentation and submit it to the contracting office, along with the contract number and the date on which the rerepresentation was completed:

The Contractor represents that it ( ) is, (X) is not a small business concern under NAICS Code 541711- assigned to contract number HDTRA1-15-C-0041.

(Contractor to sign and date and insert authorized signer's name and title).

(End of clause)

52.222-2 PAYMENT FOR OVERTIME PREMIUMS (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed $0.00 or the overtime premium is paid for work --

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

* Insert either "zero" or the dollar amount agreed to during negotiations. The inserted figure does not apply to the exceptions in paragraph (a)(1) through (a)(4) of the clause.

(End of clause)

52.244-2 SUBCONTRACTS (OCT 2010)

(a) Definitions. As used in this clause--

Approved purchasing system means a Contractor's purchasing system that has been reviewed and approved in accordance with Part 44 of the Federal Acquisition Regulation (FAR).

Consent to subcontract means the Contracting Officer's written consent for the Contractor to enter into a particular subcontract.

Subcontract means any contract, as defined in FAR Subpart 2.1, entered into by a subcontractor to furnish supplies or services for performance of the prime contract or a subcontract. It includes, but is not limited to, purchase orders, and changes and modifications to purchase orders.

(b) When this clause is included in a fixed-price type contract, consent to subcontract is required only on unpriced contract actions (including unpriced modifications or unpriced delivery orders), and only if required in accordance with paragraph (c) or (d) of this clause.

(c) If the Contractor does not have an approved purchasing system, consent to subcontract is required for any subcontract that—

(1) Is of the cost-reimbursement, time-and-materials, or labor-hour type; or

(2) Is fixed-price and exceeds—

(i) For a contract awarded by the Department of Defense, the Coast Guard, or the National Aeronautics and Space Administration, the greater of the simplified acquisition threshold or 5 percent of the total estimated cost of the contract; or

(ii) For a contract awarded by a civilian agency other than the Coast Guard and the National Aeronautics and Space Administration, either the simplified acquisition threshold or 5 percent of the total estimated cost of the contract.

(d) If the Contractor has an approved purchasing system, the Contractor nevertheless shall obtain the Contracting Officer's written consent before placing the following subcontracts:

(e)(1) The Contractor shall notify the Contracting Officer reasonably in advance of placing any subcontract or modification thereof for which consent is required under paragraph (b), (c), or (d) of this clause, including the following information:

(i) A description of the supplies or services to be subcontracted.

(ii) Identification of the type of subcontract to be used.

(iii) Identification of the proposed subcontractor.

(iv) The proposed subcontract price.

(v) The subcontractor's current, complete, and accurate certified cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions.

(vi) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract.

(vii) A negotiation memorandum reflecting—

(A) The principal elements of the subcontract price negotiations;

(B) The most significant considerations controlling establishment of initial or revised prices;

(C) The reason certified cost or pricing data were or were not required;

(D) The extent, if any, to which the Contractor did not rely on the subcontractor's certified cost or pricing data in determining
the price objective and in negotiating the final price;

(E) The extent to which it was recognized in the negotiation that the subcontractor's certified cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and the subcontractor; and the effect of any such defective data on the total price negotiated;

(F) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(G) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(2) The Contractor is not required to notify the Contracting Officer in advance of entering into any subcontract for which consent is not required under paragraph (c), (d), or (e) of this clause.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination—

(1) Of the acceptability of any subcontract terms or conditions;

(2) Of the allowability of any cost under this contract; or

(3) To relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract or modification thereof placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement type subcontracts shall not exceed the fee limitations in FAR 15.404-4(c)(4)(i).

(h) The Contractor shall give the Contracting Officer immediate written notice of any action or suit filed and prompt notice of any claim made against the Contractor by any subcontractor or vendor that, in the opinion of the Contractor, may result in litigation related in any way to this contract, with respect to which the Contractor may be entitled to reimbursement from the Government.

(i) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

(j) Paragraphs (c) and (e) of this clause do not apply to the following subcontracts, which were evaluated during negotiations:

Kitware, Inc.
International Society for Infectious Diseases

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil

(End of clause)

52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Defense Acquisition Regulations System, Department Of Defense (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

252.204-9004 IMPLEMENTATION OF DISCLOSURE OF INFORMATION (AUG 2014)

In accordance with DFARS 252.204-7000 Disclosure of Information, any information to be released shall be submitted at least 10 days before the proposed release date, for security and policy review. Submit one copy to each below:

(a) Office of Public Affairs, DTRA/J0XGP, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(b) Contracting Officer, Brian Nuckols, DTRA/J4CRC, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(c) Program Manager, Christopher Kiley, DTRA/J9CB, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(End of Clause)

252.235-7010 Acknowledgment of Support and Disclaimer. (MAY 1995)

(a) The Contractor shall include an acknowledgment of the Government's support in the publication of any material based on or developed under this contract, stated in the following terms: This material is based upon work supported by the Defense Threat Reduction Agency under Contract No. HDTRA1-15-C-0041.

(b) All material, except scientific articles or papers published in scientific journals, must, in addition to any notices or disclaimers by the Contractor, also contain the following disclaimer: Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Defense Threat Reduction Agency.

(End of clause)

252.245-9000 Government Property (MAY 2013)

(a) In accordance with FAR 52.245-1(b), Property Management, and FAR 52.245-1(f), Contractor Plans and Systems, the Contractor shall have a system to manage (control, use, preserve, protect, repair and maintain) Government property in its possession.

(b) The Contractor shall complete and return the applicable attachment(s) electronically:

i. Requisitioned Government-Furnished Property (RGFP) to include the following:

If Non-Reimbursable:	If Reimbursable:
Item#	Item#
Description	Description
CAGE Code	S Limit Authorized
Marking Instrument	Marking Instrument
NSN	NSN
Nomen	Nomen
Part or Indent#	Part or Indent
Quantity	Quantity
Type Designator	Unit of Measure
Unite Acquisition Cost	Use As Is

Unit of Measure
Use As Is

ii. Scheduled Government-Furnished Property (SGFP) to include the following:

If Serialized Items List:	If Non –Serialized Items List:
Item#	Item#
Description	Description
CAGE	CAGE
Marking Instrument	Marking Instrument
Model#	Model#
NSN	NSN
Nomen	Nomen
Part#	Part#
Part or Indent#	Part or Indent
Quantity	Quantity
Serial#	Type Designator
Type Designator	Unit Acquisition Cost
Unit Acquisition Cost	Unit of Measure
Unit of Measure	Use As Is
Use As Is	

The electronic property links are as follows:

Requisitioned Government-Furnished Property (RGFP):
http://www.acq.osd.mil/dpap/pdi/pc/docs/RequisitionedGovernmentFurnishedPropertyFORM.pdf

Scheduled Government-Furnished Property (SGFP):
http://www.acq.osd.mil/dpap/pdi/pc/docs/ScheduledGovernmentFurnishedPropertyFORM.pdf

(c) The Government Site Visits/Physical Inventory – The DTRA will annually verify the Property in the Possession of the Contractor. The Contactor's Point of Contact shall coordinate with the Program Manager/Contracting Officer Representative or DTRA Accountable Property Officer (APO) on prearranged site visits upon request.

(d) The physical inventory report shall be validated/confirmed via signature by both the Contractor's Property Administrator and the DTRA's Government Representative (i.e. COR, APO, etc.). Inventory discrepancies must be reported immediately to the Contracting Officer, COR/Program Manager and resolved by the DTRA APO.

(e) Inventory Disposal Schedule – When applicable, the Contractor shall submit the inventory disposal schedule to the DTRA Logistics Office (DTRA J4L) for approval 45 days prior to submission of an inventory disposal schedule to the Plant Clearance Officer.

(End of Clause)

252.203-7999
Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements. (DEVIATION 2015-O0010)(FEB 2015)

(a) The Contractor shall not require employees or subcontractors seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or contactors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The Contractor shall notify employees that the prohibitions and restrictions of any internal confidentiality agreements covered by this clause are no longer in effect.

(c) The prohibition in paragraph (a) of this clause does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d)(1) In accordance with section 743 of Division E, Title VIII, of the Consolidated and Further Continuing Resolution Appropriations Act, 2015, (Pub. L. 113-235), use of funds appropriated (or otherwise made available) under that or any other Act may be prohibited, if the Government determines that the Contractor is not in compliance with the provisions of this clause.

(2) The Government may seek any available remedies in the event the Contractor fails to perform in accordance with the terms and conditions of the contract as a result of Government action under this clause.

(End of clause)

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	CDRLs	6	08-APR-2015
Attachment 1	Statement of Work	3	13-MAR-2015
Attachment 2	Subcontracting Plan	6	27-MAR-2015
Attachment 3	Data Rights Assertion List	1	12-SEP-2014

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP ____ TM ____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A001	Project Spend Plan		18 ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-81468	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	N/A	See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

16. REMARKS

1. Submission shall be furnished electronically via e-mail in contractor format
2. First submission within 30 days of contract award. Updates to be made annually.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6) S&T Manager	4/8/2015	(b)(6) (b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A002	Meeting/Teleconference Minutes		18 ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-ADMN-81505	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		N/A	N/A

16. REMARKS

BLOCK 10: Frequency depends on number of meetings and teleconfernces

BLOCK 12: The contractor shall provide meeting minutes within 7 days after all meetings/teleconferences.

The minutes shall be provided via email in Microsoft Office compatible format.

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6) S&T Manager	4/8/2015	(b)(6) (b)(6)	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP ____ TM ____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A003	Monthly Progress & Cost Status Report	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80555A	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		Monthly	5 calendar days after month's end

8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A	Contract Award	5 calendar days after end of each month

16.REMARKS

The Monthly Progress & Cost Status Report shall highlight the technical progress made during the previous month, as well as provide quantitative estimates of cost, performance, and schedule, by month.

BLOCK 4: Paragraphs, subparagraphs, and line items described in DI-MGMT-80555A may be omitted or edited for appropriateness with prior approval from the Contracting Office. Please provide final recommended content and format to the contracting office with the response to the fact finding letter.

Monthly Progress Reports shall be provided via email in Microsoft Office compatible format to the Contracting Officer's Representative (COR).

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

17. PRICE GROUP
18 ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager	4/8/2015	(b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP ____ TM ____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A004	Patents - Reporting of Subject Inventions	N/A

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
		See Block 16	See Block 16

16. REMARKS

16. REMARKS

Invention Disclosures/Patents – Subject Inventions Disclosures and Reports in accordance with either DFARS 252.227-7039 (Patents – Reporting of Subject Inventions)/FAR 52.227-11 (Patent Rights – Ownership by the Contractor) or DFARS 252.227-7038 (Patent Rights – Ownership by the Contractor) (Large Business) : (1) Provide copies of invention disclosures for subject inventions within 2 months of an employee inventor reporting a subject invention to the Contractor (or, for large businesses, within 6 months after the Contractor first becomes aware that a subject invention has been made, whichever is earlier); (2) submit DD Form 882 every 12 months from the date of the contract award, even if no inventions are made during that period; (3) submit DD Form 882 in a final report, even if no inventions are made during the contract term; (4) submit a written statement of Contractor's election whether or not to retain ownership in a subject invention within 2 years of providing the invention disclosure, or, if any publication, on sale or public use of the subject invention has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, not later than 60 days prior to the end of the statutory period; (5) provide a copy of either a filed provisional or a filed nonprovisional patent application on an elected subject invention within 1 year after the election of title of the subject invention, or within the 1-year statutory period if it has been initiated, with an acknowledgement of government rights in the specification as identified at 37 C.F.R. § 401.14(f)(4), (6) provide a copy of a filed nonprovisional patent application on an elected subject invention within 10 months after filing the provisional patent application on the elected subject invention; and (7) provide for every subject invention upon which a patent application has been filed or a patent issued, a nonexclusive, nontransferable, irrevocable, paid-up license to the Government to practice, or have practiced for or on its behalf, the subject invention throughout the world, and an irrevocable power to inspect and make copies of the patent application file.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6)	4/8/2015	(b)(6)	4/8/2015
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP ____ TM ____ OTHER Software

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A005	Computer Software Product	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

16. REMARKS

The contractor will deliver software that can interface with the Biosurveillance Ecosystem (BSVE) and should include both source and executable codes. The software deliverables will be the following:

Within 12 months of contract award:

- Connect GRITS Girder database to the BSVE
- Prototype GRITS event recommendations and filtering
- Connect GRITS diagnostic and text-mining APIs to the BSVE
- Build BSVE interface to GRITS with the SDK
- Build mechanisms to crowdsource annotations
- Incorporate disease network graphs to assist diagnostics
- Support diagnostic algorithm development with dashboard
- Populated EDIR database
- Crowdsourced labels and annotations

Within 24 months of contract award:

- Expand diagnostic capability to arbitrary data feeds
- Connect GRITS to EIDR/Mantle
- Update diagnostic model in near-realtime
- Use text mining to extend network graphs/ontologies
- Connect EIDR collective intelligence editor to the BSVE
- Connect GRITS diagnostic data filtering to the BSVE
- Generate disease summary reports from diagnostics
- Forecast disease emergence
- Expanded EDIR database

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA/J4LP	0	1	0
DTRA/J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6)	4/8/2015	(b)(6)	4/8/2015
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP _____ TM _____ OTHER Reports

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A006	Scientific and Technical Reports	

4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

Blk 4-5: Per DID referenced elements, contractor format is acceptable. Report shall detail all work performed under this effort, including the results of analysis, and appropriate conclusions and/or recommendations. Dataset compatible with Microsoft Excel or contractor recommended database application.

A final technical report is required by the end of the base period. Updates to this report will be required at the end of the Option Year, if exercised. The report should include the following elements:

1) A description of the research and development processes used to arrive at the results of the study
2) A detailed compilation of the results generated
3) A description of the performance characteristics of the developed software and an analysis of its likely utility for additional development and deployment
4) Recommendations for the next stages of development
5) Description of what data are required to feed the delivered alorithms and an approach for the Government to maintain access to those data feeds.

Additionally, the contractor will deliver:

- Feedback on diagnostic dashboard (Updates provided each 12 months)
- Documentation on near-realtime architecture (24 months after contract award)
- Documentation for GRITS APIs (Updates provided each 12 months)

Blk 14: Submission by electronic media is preferred; E-mail, or CD ROM in a current version of Microsoft or Adobe products readable by the COR.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
	0	1	0
DTRA/ J4LP	0	1	0
DTRA/ J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6) S&T Manager	4/8/2015	(b)(6) (b)(6) S&T Manager	4/8/2015

Statement of Work

1.0 - Objective:
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance, disease ecology, and open source communities.

2.0 - Scope:
The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital disease surveillance, animal and human biosurveillance data, spatial environmental health data, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid and accurate diagnosis of outbreaks to identify disease threats more rapidly than current methods of digital disease surveillance and to help BSVE analysts constrain complex infectious disease outbreak scenarios.

Major milestones:
1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowd source annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to EIDR and Mantle
5. Crowd source improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Forecast disease emergence spatially

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:
Task 1: Connect GRITS Girder database to the BSVE (Base Period)
1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API

5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations (Base Period)

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics (Base Period)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard (Base Period)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to EIDR/Mantle (Option Year 1)

1. Evaluate existing EIDR/Mantle API against needs of recommendation system
2. Develop capacity of EIDR/Mantle API to deliver historic event matches
3. Recommend EIDR/Mantle events (e.g., current event is similar to past outbreak)
4. Use EIDR/Mantle media to improve diagnostics and recommendation quality
5. Match GRITS data to events in EIDR and Mantle (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g., EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g., novel diseases, viral strains that have mutated, bacteria that have developed antibiotic resistance).

Task 12: Connect EIDR collective intelligence editor to the BSVE (Option Year 1)

1. Evaluate and implement changes to EIDR API for of GRITS diagnostic needs
2. Generate keywords and rules from EIDR data to incorporate into GRITS text mining
3. Incorporate EIDR data into diagnostic model training
4. Design user interface for expert review and editing of EIDR events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with EIDR

Task 13: Connect GRITS diagnostic data filtering to the BSVE (Option Year 1)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics (Option Year 1)

1. Create algorithms for generating statistics (e.g., case counts) and visualizations (e.g., epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence (Option Year 1)

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

- Project Spend Plan (In accordance with Exhibt A Contract Data Requirements List)
- Meeting and Teleconference Minutes (In accordance with Exhibt A Contract Data Requirements List)
- Monthly Progress & Cost Status Reports (In accordance with Exhibt A Contract Data Requirements List)
- Software (In accordance with Exhibt A Contract Data Requirements List)
- Reports (In accordance with Exhibt A Contract Data Requirements List)

March 26, 2015

EcoHealth Alliance Subcontracting Plan for HDTRA114-AMD1-CBA-03-2-0022

Per FAR 19.704, we have detailed below our individual subcontracting plan to maximize small business potential in our contracting efforts for Base Year, Option Year 1.

Table 1. Estimated Proposed Subcontracting Amounts for Base Year of Contract

Socioeconomic Concern	Base Year Amount Subcontracted to Small Business	Option 1 Amount Subcontracted to Small Business	Base Year Percentage of overall value of total Base Year contract (Small business subcontracted amount /Total contract amount)	Option Year 1 Percentage of overall value of total Option 1 Year contract (Small business subcontracted amount /Total contract amount)
Small Business (including ANC and Indian Tribes)	$506,686.72	$521,887.33	21%	21%
Veteran-owned small business	$0	$0	0%	0%
Service-Disabled Veteran Owned Small Business -	$0	$0	0%	0%
Service-Disabled Veteran Owned Small Business	$0	$0	0%	0%
HUBZone Small Business -	$0	$0	0%	0%
Small Disadvantaged Business (including ANCs and Indian tribes)	$0	$0	0%	0%
Women-Owned Small Business Concerns	$0	$0	0%	0%

1) The breakdown of our percentage goals for subcontracted dollars for the **Base Year** is as follows

- Small Business (including ANCs and Indian Tribes)- 20%
- Veteran-owned small business - 0%
- Service-Disabled Veteran owned Small Businesses- 0%
- HUBzone Small Business - 0%
- Small Disadvantaged Business (including ANCs and Indian tribes) - 0%
- Women-owned Small Business Concerns - 0%

The breakdown of our percentage goals for subcontracted dollars for **Option Year 1** is as follows

- Small Business (including ANCs and Indian Tribes)- 20%
- Veteran-owned small business - 0%
- Service-Disabled Veteran owned Small Businesses- 0%
- HUBzone Small Business - 0%
- Small Disadvantaged Business (including ANCs and Indian tribes) - 0%
- Women-owned Small Business Concerns - 0%

2) The total amount of dollars to be subcontracted for this proposal in the **Base year** is $631,208.71. EcoHealth Alliance (EHA) plans to subcontract $506, 686.72 in the Base Year to Small Businesses (Kitware). This is approximately 80% of all subcontracted dollars. This small business is not an ANC or Indian Tribe. EHA plans to subcontract $0 to veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business (including ANCs and Indian tribes) and women-owned small business concerns.

The total amount of dollars to be subcontracted for this proposal in **Option Year 1** is $650,144.98. EHA plans to subcontract $521,887.33 in the Option Year 1 to Small Businesses (Kitware). This is approximately 80% of all subcontracted dollars. This small business is not an ANC or Indian Tribe. EHA plans to subcontract $0 to veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business (including ANCs and Indian tribes) and women-owned small business concerns.

(3) Supplies and services to be contracted to our small business subcontractor (Kitware) includes machine learning, text analysis, software development, data management, and data visualization. Kitware is a unique scientific organization, selected on the basis of the nature of the work, good faith efforts to identify capable small business firms, and the precedent of successful prior collaborations with EHA. Specifically, they were selected on the basis of professional accomplishments, niche expertise, proven track record, and the precedent of previously having developed custom biosurveillance products to interfaced with their products and expertise.

(4) The total and categorical percentage awards are lower than DoD's goals due to the specialized work to be completed the proposed work and the previous collaboration with subcontractors on previous and related research and development contracts with EHA (funded by DTRA). These methods are used to develop subcontracting goals:

The Principal Investigator (PI; Dr. Andrew G. Huff) will consult with the Chief Financial Officer (CFO; Mr. Harvey Kasdan), to clearly identify the goods and services that will be subcontracted and will search source lists to identify small, disadvantaged, women-owned, SBA HUBzone, veteran owned, and service disabled veteran owned firms that can provide these goods and services. EHA will investigate the identified firms' capabilities and the past performance of these firms to determine if they are qualified to provide the goods and services required. If there are qualified small, disadvantaged, women-owned, SBA HUBzone, veteran owned, or service disabled veteran owned firms that offer the needed goods or services, they will be used whenever possible. Reasonable goals are established before considering the value of the needed subcontracts and the after identifying the pool of qualified firms.

(5) The internal identification and selection process for subcontractors are as follows:

1. Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions.
2. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to determine their capacity, and their local relationships. Extensive review includes CV's of principal investigators and their staff, organizational and administrative capacity, annual report and audit report reviews, indirect cost rate review, and history of the institution.
3. We conduct a complete review of prospective subcontractors among senior staff, with a recommendation to the President for final decision.
4. Source lists used in making the determinations:
    - www.pro-net.sba.gov, the SBA online database of small businesses
    - www.sba.gov/hubzone, the SBA online database of locations that qualify as HUBZones
    - Local Office of the Small Business Administration

(6) Indirect costs were not included in our goals. Kitware and ISDS have their own approved overhead and indirect rates. Their sub-award contains overhead and indirect rates.

(7)

Name:	Dr. Andrew G. Huff
Title:	Senior Scientist
Address:	460 West 34th Street 17th Floor New York, NY 10001
Telephone Number:	1.212.380.4497 (direct)
Email:	huff@ecohealthalliance.org

Specific duties as they relate to EHA's subcontracting program are:

- Identifies potential subcontractors based on the methods described above
- Survey's SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned businesses for potential inclusion in all solicitations for products or services which they are capable of providing
- Works with finance and administration departments to identify future subcontracting goals
- Coordinates with subcontractors and assures subcontracting reports are submitted in accordance with EHA and U.S. government policies
- Prepares and submits periodic subcontracting reports as outlined in this plan

(8) EHA gives careful consideration to small businesses that could provide the services we require. On this basis, we identified one recognized small business entity in the field (Kitware) that had the ability, expertise and the capacity to accomplish these goals and that would be able to compliment the expertise of our organization to accomplish the tasks detailed in our statement of work (SOW). Per FAR 19.703 (2)(b), we rely on written documentation to confirm a subcontractor's status as a small business. Due to the scientifically specific nature of the work that is proposed, we were unable, to the best of our ability, to identify areas of the work that could be further subcontracted, or qualified firms that could help EHA achieve our broader small business goals (e.g., veteran, disadvantaged, HUB, women, disabled). Beyond the specific goals of this proposal, EHA makes every effort to provide opportunities for small businesses.

(9) EHA will include the clause at 52.219-8, Utilization of Small Business Concerns (see 19.708(a)), in all subcontracts that offer further subcontracting opportunities, and will require all subcontractors (except small business concerns) that receive subcontracts in excess of $650,000 ($1.5 million for construction) to adopt a plan that complies with the requirements of the clause at 52.219-9, Small Business Subcontracting Plan (see 19.708(b));

(10) EHA agrees to cooperate in any studies or surveys that may be required. EHA agrees to submit periodic reports (annually, or when requested by DTRA) so the government can determine the extent of compliance by EHA to the subcontracting plan.

- EHA will submit an Individual Subcontract Report (ISR) and a Summary Subcontract Report (SSR) using eSRS when required.
- EHA will submit a ISR semi-annually and within 30 days of contract completion. We will use the eSRS system and follow the instructions detailed on the eSRS system
- EHA will submit an SSR annuals for the twelve month period ending September 30th. We will use the eSRS system and follow the instructions detailed on the eSRS system.
- EHA does not currently have, or plan to have subcontractors with subcontracting plans. None of EHA's subcontractors have subcontractors of their own.

(11) EHA agrees that it will maintain at least the following types of records to document compliance with the subcontracting plan:

- Source list, guides, and other data identifying SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns.
- Organizations contacted to locate SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns.
- On a contract-by-contract basis, records on all subcontract solicitations over $100,000, indicating for each solicitation (1) whether SB concerns were solicited, and if not, why not; (2) whether HUBZone SB concerns were solicited, and if not, why not; (3) whether SDB concerns were solicited, and if not, why not; (4) whether WOSB concerns were solicited, and if not, why not, (5) whether veteran owned or service disabled veteran concerns were solicited and if not, why not; and (6) reasons for the failure of solicited SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns to receive the subcontract award.

Based upon the above criteria, we have selected our small business contractor in accordance with our plan. We are committed to the small business goals as outlined in FAR 19.702 and will continue to administer our subcontracting program, inclusive of contractual agreements and monthly invoices and reports, in accordance with these regulations.

Cheers,

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist
EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001
1.212.380.4497 (direct)
(b)(6) (mobile)

DATA RIGHTS ASSERTION LIST

Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software

The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted

Technical data or computer software to be furnished with restrictions*	Basis for assertion**	Asserted rights category***	Name of person asserting restrictions****
None	None	None	None

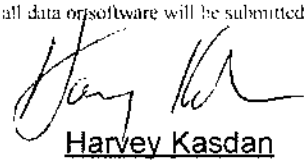
*For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such item, component, or process. For computer software or computer software documentation identify the software or documentation

**Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions

***Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses)

****Corporation, individual, or other person, as appropriate

*****Enter "none" when all data or software will be submitted without restrictions.

Signature:  Date: 09/12/14

Printed Name: Harvey Kasdan

Title: Chief Financial Officer

Company Name: EcoHealth Alliance

APL Use Only:
Forward to APL Prime Contract Representative, Program Manager and Office of Patent Counsel.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
S	1 3

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00001	20-Apr-2015	J9CBA14212	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DCMA GARDEN CITY 605 STEWART AVENUE GARDEN CITY NY 11530-4761	S3309A

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
52.232-22 Limitation of Funds

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: bishopb151339

The purpose of this modification is to:

1. Add incremental funding to CLIN 0001 in the amount of $99,550.79 under Sub-Clin 000101.
2. Update clauses 252.232-9000 and 252.232-9001.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL (b)(6) EMAIL (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 20-Apr-2015

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000101 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101			Lot		$0.00
	IF Funding				
	COST				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AB				$99,550.79
	CIN: J9CBA16659000101				

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000101:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $99,550.79 from $2,117,486.21 to $2,217,037.00.

SUBCLIN 000101:
Funding on SUBCLIN 000101 is initiated as follows:

ACRN: AB

CIN: J9CBA16659000101

Acctng Data: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255

Increase: $99,550.79

Total: $99,550.79

The following have been modified:

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,217,037.00 is obligated for work to be performed during the period beginning with contract award and continuing through the end of the base period. Additional incremental funding planned, but not obligated, is: $0.00.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed S_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of S_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of $_____C_____. Within this amount (S_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

Fill in the dollar amounts as applicable:

CLIN 0001

A: $2,217,037.00
B: $0
C: $2,217,037.00

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00002	08-Apr-2016	J9CBA19766	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DCMA GARDEN CITY 605 STEWART AVENUE GARDEN CITY NY 11530-4761	S3309A

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3	X	10B. DATED (SEE ITEM 13) 09-Apr-2015
FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14. PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
IAW FAR 52.217-9 Option to Extend the Term of the Contract

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: duncank161055
J9CBA19766

The purpose of this modification is to exercise Option Period 1 consisting of CLINs 1001 and 1002, apply incremental funding to CLIN 1001 via new SLIN 100101, update clauses 252.232-9000 and 253-232-9001, and administratively update the "Ship To Address" on CLINs 0001 and 1001 in order to reflect current COR information and comply with Department of Defense (DoD) Procurement Data Standard (PDS).

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
		(b)(6) CONTRACT SPECIALIST TEL: (b)(6) EMAIL: (b)(6)
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6)
(Signature of person authorized to sign)		(Signature of Contracting Officer)

16C. DATE SIGNED: 16-Mar-2016

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $2,262,641.00 from $2,217,037.00 to $4,479,678.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 1001
The option status has changed from Option to Option Exercised.

CLIN 1002
The option status has changed from Option to Option Exercised.

SUBCLIN 100101 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100101					$0.00
	Incremental Funding				
	COST				
	Incremental Funding for Option Peiod 1.				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AC				$1,696,980.75
	CIN: JBCBA19766000101				

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 100101:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC

POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $1,696,980.75 from $2,217,037.00 to $3,914,017.75.

SUBCLIN 100101:

Funding on SUBCLIN 100101 is initiated as follows:

ACRN: AC

CIN: JBCBA19766000101

Acctng Data: 044315 097 0400 000 N 20162017 D 2620 0602384BP_CB_CBA_RC 1617_0400_2620_TM2DN DTRA 255

Increase: $1,696,980.75

Total: $1,696,980.75

The following have been modified:

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

CLIN 0001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,217,037.00 is obligated for work to be performed during the period beginning with contract award and continuing through April 8, 2016. CLIN 0001 is FULLY FUNDED.

CLIN 1001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $1,696,980.75 is obligated for work to be performed during the CLIN 1001 period of perforamce start date of April 9, 2016 and continuing through its end date. Incremental funding planned, but not obligated is: $565,660.25.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed $_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of $_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of $_____C_____. Within this amount ($_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

CLIN 0001

A: $2,217,037.00
B: $0
C: $2,217,037.00

CLIN 1001

A: $2,262,641.00
B: $0
C: $1,696,980.75

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
S	1 | 4

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00003	14-Nov-2016	J9CBA19766	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Unilateral Mod IAW FAR 52.232-22 "Limitation of Funds"

E. IMPORTANT: Contractor ☐ is not. ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: duncank162314
J9CBA19766A

The purpose of this Modification is to:

1. Apply incremental funding to CLIN 1001 via SLIN 100101, thereby fully funding Option 1;
2. Update clauses 252.232-9000 and 252.232-9002 to reflect the increase in funding;
3. Update clause 252.209-9002, to incorporate new Non-Government Support Personnel contractors;
4. Administratively realign the NAICS code from CLIN to contract level and add the business size standard in order to comply with the Department of Defense (DoD) Procurement Data Standard (PDS) requirements; and
5. Correct Item 7. Administered by, from DCMA Garden City to ONR Boston.

All other terms and conditions remain unchanged.
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Peter Daszak, President, Ecohealth Alliance	(b)(6) TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(b)(6) (Signature of person authorized to sign)	11/9/2016	BY (b)(6) (Signature of Contracting Officer)	11/10/2016

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM
The standard size code 500 has been added.
The NAICS code 541712 has been added.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 1001
The NAICS code 541712 has been deleted.

SUBCLIN 100102 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100102					$0.00
	Incremental Funding COST Incremental Funding for Option Period 1. FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AD CIN: J9CBA19766A00001				$565,660.25

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 100102:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $565,660.25 from $3,914,017.75 to $4,479,678.00.

SUBCLIN 100102:
Funding on SUBCLIN 100102 is initiated as follows:

ACRN: AD

CIN: J9CBA19766A00001

Acctng Data: 044315 097 0400 000 N 20162017 D 2620 0603384BP_CB_CBA_RC 1617_0400_2620_TM3BD DTRA 255

Increase: $565,660.25

Total: $565,660.25

The following have been modified:

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

CLIN 0001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,217,037.00 is obligated for work to be performed during the period beginning with contract award and continuing through April 8, 2016. CLIN 0001 is FULLY FUNDED.

CLIN 1001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,262,641.00 is obligated for work to be performed during the CLIN 1001 period of perforamce start date of April 9, 2016 and continuing through its end date. CLIN 1001 is FULLY FUNDED

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed $_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of S_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of $_____C_____. Within this amount (S_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

CLIN 0001

A: $2,217,037.00
B: $0
C: $2,217,037.00

CLIN 1001

A: $2,262,641.00
B: $0
C: $2,262,641.00

SECTION H - SPECIAL CONTRACT REQUIREMENTS

The following have been modified:

252.209-9002 NON-GOVERNMENT SUPPORT PERSONNEL (JAN 2008)

The following companies may have access to contractor information, technical data or computer software that may be marked as proprietary or otherwise marked with restrictive legends: Infinity Technology, LLC (Contract Specialist support); Quanterion Solutions, Inc. (DTRIAC Technical Engineering Services); Booz Allen Hamilton (administrative support); Engility Corp. (advisory and assistance services); Kforce Government Solutions, Inc. (Accounting and Financial Systems Support). Each contract contains organizational conflict of interest provisions and/or includes contractual requirements for non-disclosure of proprietary contractor information or data/software marked with restrictive legends. The contractor, by submitting a proposal or entering into this contract, is deemed to have consented to the disclosure of its information to Infinity Technology, LLC, Quanterion Solutions, Inc., Booz Allen Hamilton, Engility Corp., and Kforce Government Solutions, Inc. under the conditions and limitations described herein.

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00004	08-Apr-2017	J9CBA19766	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Bilateral Mod IAW FAR 43.103(a)(3) Mutual Agreement

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: duncank171066

J4CRJ9CBA172109

The purpose of this modification is to:

1. Extend Option Period 1, CLINs 1001 and 1002 through to September 30, 2017 at no additional cost to the Government. As consideration for this extension, the Contractor shall develop and provide to the Government, at the Contractor's expense, a diagnostic engine that will create a summary report of separate articles that are linked to a single disease event.
2. Update CLINs 0002 and 1002 to identify them as not separately priced with a quantity of 1, and add ship to addresses in order to comply with DoD Procurement Data Standard requirements.
3. Realign ACRN AB funding from SLIN 000101 to CLIN 0001 in order to correct an issue wherein funding was incorrectly assigned to both the CLIN and SubCLIN. This realignment does not affect the total funding amount allocated to, or available for vouchers against, CLIN 0001.
4. Remove FOB and inspection terms from funding SubCLINs.
5. Replace Section G DFAS payment instruction clause 252.204-9002 with 252.204-0002.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Peter Daszak	(b)(6) TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)	3/15/17	BY (b)(6) (Signature of Contracting Officer)	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000101
The unit of issue Lot has been deleted.
The FOB Destination has been deleted.

CLIN 0002
The CLIN type priced has been added.
The pricing detail quantity 1.00 has been added.
The cost constraint NSP has been added.

SUBCLIN 100101
The FOB Destination has been deleted.

SUBCLIN 100102
The FOB Destination has been deleted.

CLIN 1002
The CLIN type priced has been added.
The pricing detail quantity 1.00 has been added.
The cost constraint NSP has been added.

SECTION E - INSPECTION AND ACCEPTANCE

The Acceptance/Inspection Schedule for SUBCLIN 000101 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for CLIN 0002 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
Destination	Government	Destination	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY

N/A	N/A	N/A	Government

The Acceptance/Inspection Schedule for SUBCLIN 100101 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for SUBCLIN 100102 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule Item has been deleted from CLIN 0002:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2015 TO 08-APR-2016	N/A	N/A FOB: Destination	

The following Delivery Schedule item has been added to CLIN 0002:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CB (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 30-SEP-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1002 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 08-APR-2017	N/A	N/A FOB: Destination	

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 30-SEP-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CB (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

CLIN 0001:

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255 (CIN J9CBA142120001) was increased by $99,550.79 from $2,117,486.21 to $2,217,037.00

SUBCLIN 000101:

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255 (CIN J9CBA166590000101) was decreased by $99,550.79 from $99,550.79 to $0.00

The following have been added by reference:

252.204-0002

The following have been deleted:

252.204-9002

(End of Summary of Changes)

From: (b)(6)
To: Andrew Huff; "Karissa Whiting"
Cc: (b)(6)
Subject: Contract Award - HDTRA1-15-C-0041
Date: Thursday, April 9, 2015 3:41:00 PM
Attachments: HDTRA-15-C-0041-FINAL-ATTACHMENTS.pdf

Dr Huff,
On behalf of DTRA, please see your attached contract award document. We will be in touch shortly to setup a contract kick-off meeting! I appreciate all of your assistance (you too Karissa!) in completing this effort!

(b)(6)
Contractor Support
Sr. Contract Specialist
JAB Solutions, LLC

Phone: (b)(6)
NEW Email: (b)(6)

Please take note of my new email address. The legacy address (brian.bishop contractor@dtra.mil) will be deleted shortly.

AWARD/CONTRACT

1 THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)		RATING	PAGE OF PAGES 1 | 37
2 CONTRACT (Proc. Inst. Ident.) NO HDTRA1-15-C-0041	3 EFFECTIVE DATE 09 Apr 2015	4 REQUISITION/PURCHASE REQUEST/PROJECT NO J9CBA14212	

5 ISSUED BY CODE HDTRA1
DEFENSE THREAT REDUCTION AGENCY/J4C
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201

6 ADMINISTERED BY (If other than item 5) CODE S0506A
DCMA GARDEN CITY
605 STEWART AVENUE
GARDEN CITY NY 11530-4761

7 NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)
ECOHEALTH ALLIANCE INC.
MR. ALEKSEI CHMURA
460 W 34TH ST 17TH FL
NEW YORK NY 10001-2320

8 DELIVERY
[ ] FOB ORIGIN [X] OTHER (See below)

9 DISCOUNT FOR PROMPT PAYMENT

10 SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN ITEM

CODE 3MMU3 FACILITY CODE

11 SHIP TO/MARK FOR CODE HDTRA1
DEFENSE THREAT REDUCTION AGENCY
SEE SEPARATE LETTER
8725 JOHN J. KINGMAN RD., MSC 6201
FORT BELVOIR VA 22060

12 PAYMENT WILL BE MADE BY CODE HQ0337
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182266
COLUMBUS OH 43218-2266

13 AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )

14 ACCOUNTING AND APPROPRIATION DATA
See Schedule

15A ITEM NO	15B SUPPLIES/ SERVICES	15C QUANTITY	15D UNIT	15E UNIT PRICE	15F AMOUNT
	SEE SCHEDULE				

15G TOTAL AMOUNT OF CONTRACT **$2,217,037.00**

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(X)	SEC	DESCRIPTION	PAGE(S)	(X)	SEC	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM	1	X	I	CONTRACT CLAUSES	17 - 36
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 3			**PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS**	
	C	DESCRIPTION/ SPECS./ WORK STATEMENT		X	J	LIST OF ATTACHMENTS	37
X	D	PACKAGING AND MARKING	4			**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	5		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	6		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
X	G	CONTRACT ADMINISTRATION DATA	7 - 11		M	EVALUATION FACTORS FOR AWARD	
X	H	SPECIAL CONTRACT REQUIREMENTS	12 - 16				

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17 [X] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 1 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18 [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A NAME AND TITLE OF SIGNER (Type or print)
HARVEY KASDAN, CFO

20A NAME OF CONTRACTING OFFICER
(b)(6) Contracting Officer
(b)(6) (b)(6)

19B NAME OF CONTRACTOR
BY _____ (Signature of person authorized to sign)

19C DATE SIGNED
4/9/2015

20B UNITED STATES OF AMERICA
(b)(6)
BY _____ (Signature of Contracting Officer)

20C DATE SIGNED
04/09/2015

AUTHORIZED FOR LOCAL REPRODUCTION
Previous edition is usable

STANDARD FORM 26 (REV. 12/2003)
Prescribed by GSA
FAR (48 CFR) 53.214(a)

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot		$2,217,037.00
	Base Period - PSC: AD92				
	COST				
	The Contractor shall perform the project entitled "Global Rapid Identification System (GRITS)," in accordance with Tasks 1-7 in the Statement of Work dated March 13, 2015 and incorporated into this contract as Attachment 1.				
	FOB: Destination				
	PURCHASE REQUEST NUMBER: J9CBA14212				
				ESTIMATED COST	$2,217,037.00
	ACRN AB CIN: J9CBA142120001				$2,117,486.21

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002			Lot		$0.00
	CDRLs				
	COST				
	CDRLs in accordance Exhibit A Contract Data Requirements List.				
	FOB: Destination				
				ESTIMATED COST	$0.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1001		1	Lot		$2,262,641.00
OPTION	Option I Period - PSC: AD92				
	COST				
	The Contractor shall perform the project entitled "Global Rapid Identification System (GRITS)," in accordance with Tasks 8-15 in the Statement of Work dated March 13, 2015 and incorporated into this contract as Attachment 1.				
	FOB: Destination				
				ESTIMATED COST	$2,262,641.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1002			Lot		$0.00
OPTION	CDRLs				
	COST				
	CDRLs in accordance Exhibit A Contract Data Requirements List.				
	FOB: Destination				
				ESTIMATED COST	$0.00

BAA REFERENCE

This contract is awarded as a result of HDTRA1-14-CHEM-BIO-BAA, Research and Development Broad Agency Announcement (BAA).

Section D - Packaging and Marking

CLAUSES INCORPORATED BY FULL TEXT

252.247-9001 PACKAGING AND MARKING

(a) All data contained in Exhibit A, Contract Data Requirements List (CDRL), DD Form 1423 delivered under this contract shall be delivered using best commercial practices to meet the packaging requirements of the carrier and to insure delivery, to the addressees specified on the Data Item Cover Sheet, at destination and in accordance with applicable security requirements.

(b) All data and correspondence submitted to the Contracting Officer shall reference the Contract Number, the CDRL number, and the date submitted. A copy of all correspondence sent to the Contracting Officer's Representative (COR) or Project Manager shall be simultaneously provided to the Contracting Officer.

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
0002	Destination	Government	Destination	Government
1001	Destination	Government	Destination	Government
1002	Destination	Government	Destination	Government

CLAUSES INCORPORATED BY REFERENCE

52.246-9	Inspection Of Research And Development (Short Form)	APR 1984

CLAUSES INCORPORATED BY FULL TEXT

252.246-9000 INSPECTION AND ACCEPTANCE (JUL 2007)

Government inspection and acceptance of data is specified on the Contract Data Requirements List, DD Form 1423. In accordance with FAR 52.246-9, inspection and acceptance for all work performed at any and all times under this contract shall be the responsibility of the:

__X___ Contracting Officer's Representative (COR) or Project Manager (PM). The Wide Area Work Flow (WAWF) Acceptor DoDDAC is located in DTRA 252.201-9000 *Project Manager* or DTRA 252.201-9002 *Contracting Officer's Representative.*

_____ Administrative Contracting Officer (ACO). The WAWF Acceptor DoDAAC can be found in the "Administered By" block on page 1 of the contract.

(End of Clause)

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1
0002	POP 09-APR-2015 TO 08-APR-2016	N/A	N/A FOB: Destination	
1001	POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1
1002	POP 09-APR-2016 TO 08-APR-2017	N/A	N/A FOB: Destination	

CLAUSES INCORPORATED BY REFERENCE

52.242-15 Alt I	Stop-Work Order (Aug 1989) - Alternate I	APR 1984
52.247-34	F.O.B. Destination	NOV 1991

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP CB CBA RC 1516 0400 2620 TM2DN DTRA 255
AMOUNT: $2,117,486.21
CIN J9CBA142120001: $2,117,486.21

CLAUSES INCORPORATED BY REFERENCE

52.232-33	Payment by Electronic Funds Transfer--System for Award Management	JUL 2013
252.201-7000	Contracting Officer's Representative	DEC 1991
252.204-7006	Billing Instructions	OCT 2005
252.232-7003	Electronic Submission of Payment Requests and Receiving Reports	JUN 2012
252.232-7006	Wide Area WorkFlow Payment Instructions	MAY 2013

CLAUSES INCORPORATED BY FULL TEXT

252.201-9002 CONTRACTING OFFICER'S REPRESENTATIVE (MAY 2007)

a. The Contracting Officer's Representative (COR) for this contract is:
__X__ SEE SEPARATE LETTER

____ _____
Defense Threat Reduction Agency/_____
1680 Texas St SE
Kirtland AFB NM 87117-5669
Telephone number (505) ___-____
e-mail address_____@abq.dtra.mil.
WAWF Acceptor DoDAAC: HDTRA2

b. The COR will act as the Contracting Officer's Representative for technical matters providing technical direction and discussion as necessary with respect to the specification/statement of work and monitoring the progress and quality of the Contractor's performance. The COR is NOT an Administrative Contracting Officer (ACO) and does not have the authority to take any action, either directly or indirectly that would change the pricing, quality, quantity, place of performance, delivery schedule, or any other terms and conditions of the contract, or to direct the accomplishment of effort, which goes beyond the scope of the specifications/statement of work in the contract.

c. When, in the opinion of the contractor, the COR requests effort outside the existing scope of the contract, the contractor shall promptly notify the Contracting Officer in writing. No action shall be taken by the contractor under such direction until the Contracting Officer has issued a modification to the contract or has otherwise resolved the issue.

252.204-9002 PAYMENT INSTRUCTIONS FOR MULTIPLE ACCOUNTING CLASSIFICATION CITATIONS (MAY 2012)

In accordance with DFARS 204.7108 Payment Instructions, payment shall be made by the numbered payment instruction identified below:

Line item specific: sequential ACRN order.
252.204-0002 Line Item Specific: Sequential ACRN Order. (SEP 2009)

If there is more than one ACRN within a contract line item, the payment office will make payment in sequential ACRN order within the line item, exhausting all funds in the previous ACRN before paying from the next ACRN using the following sequential order: Alpha/Alpha; Alpha/Numeric; Numeric/Alpha; and Numeric/Numeric.

CLAUSES INCORPORATED BY FULL TEXT

252.216-9005 PROFIT OR FEE ON TRAVEL COSTS (JUL 2008)

Travel shall not be a profit or fee bearing cost element.

(End of clause)

CLAUSES INCORPORATED BY FULL TEXT

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,117,486.21 is obligated for work to be performed during the period beginning with contract award and continuing through the end of the base period. Additional incremental funding planned, but not obligated, is: $99,551.79.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed $_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of $_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of S_____C_____. Within this amount (S_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

Fill in the dollar amounts as applicable:

CLIN 0001

A: S2,217,037.00
B: $0
C: S2,117,486.21

252.232-9012 WIDE AREA WORK FLOW (WAWF) – RECEIPT AND ACCEPTANCE (RA) INSTRUCTIONS (November 2011)

(a) As prescribed in DFARS clause 252.232-7003 Electronic Submission of Payment Requests (Jan 2004), Contractors must submit payment requests in electronic form. Paper copies will no longer be accepted or processed for payment unless the conditions of DFARS clause 252.232-7003(c) apply. To facilitate this electronic submission, the Defense Threat Reduction Agency (DTRA) has implemented the DoD sanctioned Wide Area Workflow-Receipt and Acceptance (WAWF-RA) for contractors to submit electronic payment requests and receiving reports. The contractor shall submit electronic payment requests and receiving reports via WAWF-RA. **Vendors shall send an email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract by clicking on the Send Additional Email Notifications link upon every submission of an invoice/cost voucher in WAWF-RA. To access WAWF, go to https://wawf.eb.mil.**

**** For questions, contact the DTRA WAWF Team at wawfhelp@dtra.mil ****

(b) Definitions:

Acceptor: Contracting Officer's Representative, Program/Project Manager, or other government acceptance official as identified in the contract/order.

Pay Official: Defense Finance and Accounting Service (DFAS) payment office identified in the contract/order.

SHIP To/Service Acceptor DoDAAC: Acceptor DoDAAC or DCMA DoDAAC (as specified in the contract/order).

DCAA Auditor DoDAAC: Needed when invoicing on cost-reimbursable contracts. (Go to www.dcaa.mil and click on the appropriate link under the Audit Office Locator to search for your DCAA DoDAAC.)

>>>>> For contracts that are administered by the **Office of Naval Research (ONR)**: <<<<<
Enter the ONR DoDAAC in the DCAA Auditor DoDAAC field in WAWF.

(c) WAWF Contractor Input Information:

The contractor shall use the following information in creating electronic payment requests in WAWF:

Invoice Type in WAWF:

If billing for Cost Type/Reimbursable contracts (including T&M and LH), select "Cost Voucher"
If billing for Firm-Fixed Price (FFP) Materials Only, select "Combo"
If billing for FFP Materials and Service, select "Combo"
If billing for FFP Services Only, select "2-n-1 (Services Only)"

** If the contract contains both FFP and Cost Type (including T&M and LH) line items, they must be invoiced separately on appropriate types mentioned above. Upon the written approval of the Project Manager or Contracting Officer's Representative, the contractor may invoice both line items in one type of invoice.

For WAWF Routing Information, See Table Below:

Description	SF 26	SF 33	SF 1449	DD 1155
	Located in Block/Section			
Contract Number	2	2	2	1
Delivery Order	See Individual Order		4	2
CAGE Code	7	15a	17a	9
Pay DoDAAC	12	25	18a	15
Inspection	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Acceptance	Section E (except SF 1449, See Entitled): INSPECTION AND ACCEPTANCE			
Issue Date	3	5	3	3
Issue By DoDAAC	5	7	9	6
Admin DoDAAC	6	24	16	7
Ship To / Service Acceptor DoDAAC	6	24	16	7
Ship to Extension	Do Not Fill In			
Services or Supplies	Based on majority of requirement as determined by monetary value			
Final Invoice?	Do not change "N" (no) to "Y" (yes) unless this is the last invoice and the contract is ready for closeout.			

(d) Final Invoices/Vouchers -Final Payment shall be made in accordance with the Federal Acquisition Regulation (FAR) 52.216-7, entitled "Allowable Cost and Payment."

Invoices - Invoice 2-n-1 (Services Only) and Invoice and Receiving Report (Combo)
Select the ***"Y"*** selection from the ***"Final Invoice?"*** drop-down box when submitting the final invoice for payment for a contract. Upon successful submission of the final invoice, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the Contracting Officer Representative (COR), Program/Project Manager or other government acceptance official identified in the contract.

Cost Vouchers - Once the final DCAA audit is complete for cost reimbursable contracts and authorization is received to submit the final cost voucher, select the ***"Y"*** selection from the ***"Final Voucher"*** drop-down box when submitting the final cost voucher. Upon successful submission of the final cost voucher, click on the ***Send Additional Email Notifications*** link to send an additional email notification to the following email address: finalcostvouchers@dtra.mil

(e) WAWF Training may be accessed online at http://www.wawftraining.com. To practice creating documents in WAWF, visit the practice site at https://wawftraining.eb.mil. General DFAS information may be accessed using the DFAS website at http://www.dfas.mil/. Payment status information may be accessed using the myInvoice system at https://myinvoice.csd.disa.mil. Your contract number and shipment/invoice number will be required to check status of your payment.

Note: For specific invoice related inquiries email: vendorpay@dtra.mil. Vendors shall forward any additional DTRA related WAWF questions to wawfhelp@dtra.mil.

252.242-9003 - ASSIGNMENT OF CONTRACT ADMINISTRATION SERVICES (CAS) FUNCTIONS (FEB 2012)

a. The contract administration functions stated in FAR 42.302(a) are assigned to: See Page 1, Section A, Block 6 of this contract.

b. Notwithstanding that assignment, in accordance with FAR 42.202(b)(2), the following functions are determined to be best performed by the PCO and are retained by the DTRA Contracting Office:

(1) FAR 42.302(a)(3) Conduct post-award orientation conferences.

(2) FAR 42.302(a)(20) Ensure processing and execution of duty-free entry certificates.

(3) FAR 42.302(a)(40) Perform engineering surveillance to assess compliance with contractual terms for schedule, cost, and technical performance in the areas of design, development, and production.

(4) FAR 42.302(a)(51) Consent to the placement of subcontracts.

(5) Approval or disapproval of the data items listed on Exhibit A, DD Form 1423, Contract Data Requirements List.

(END OF CLAUSE)

Section H - Special Contract Requirements

CLAUSES INCORPORATED BY FULL TEXT

252.201-9003 LIMITATION OF AUTHORITY (JUN 2009)

No person in the Government, other than a Contracting Officer, has the authority to provide direction to the Contractor, which alters the Contractor's obligations or changes this contract in any way. If any person representing the Government, other than a Contracting Officer, attempts to alter contract obligations, change the contract specifications/statement of work or tells the contractor to perform some effort which the Contractor believes to be outside the scope of this contract, the Contractor shall immediately notify the Procuring Contracting Officer (PCO). Contractor personnel shall not comply with any order or direction which they believe to be outside the scope of this contract unless the order or direction is issued by a Contracting Officer.

CLAUSES INCORPORATED BY FULL TEXT

252.203-9000 Prohibition on the Use of Senior Mentors (JUNE 2010)

(a) The use of senior mentors by the Defense Threat Reduction Agency (DTRA) enhances the readiness of the Agency across a wide range of strategic, operational, joint, functional, technical, management and development mission areas. The relevant prior service, joint force experience, and unique expertise of these senior consultants provide senior leadership with valuable insights and contribute to the continuous improvement of the Agencies' operations.

(b) For the purposes of this clause, Senior Mentor is defined as a retired flag, general or other military officers (O-6) or retired senior civilian official (Senior Executive Service (SES), Senior Level (SL), Scientific and Professional (ST)) who provides expert experience-based mentoring, teaching, training, advice, and recommendations to senior military officers, staffs and students as they participate in war games, warfighting courses, operational planning, operational exercises, and decision-making exercises.

(c) In accordance with Secretary of Defense Memorandum entitled "Policy on Senior Mentors" dated April 1, 2010, DTRA will hire all senior mentors as highly qualified experts (HQE) under 5 U.S.C. 9903. This policy balances the need for DTRA to secure the specialized knowledge required for these operational exercises with the need to hire such experts in a manner that promotes public trust and confidence.

(d) The Contractor shall not include the use of senior mentors in bids or proposals for services/supplies offered to DTRA.

(e) The Contractor shall include the substance of this clause in all subcontracts.

(End of Clause)

CLAUSES INCORPORATED BY FULL TEXT

252.209-9002 NON-GOVERNMENT SUPPORT PERSONNEL (JAN 2008)

The following companies may have access to contractor information, technical data or computer software that may be marked as proprietary or otherwise marked with restrictive legends: JAB Solutions (Contract Specialist support); Quanterion Solutions, Inc. (DTRIAC Technical Engineering Services); Booz Allen Hamilton (administrative support); TASC (advisory and assistance services); Kforce Government Solutions, Inc. (Accounting and Financial Systems Support). Each contract contains organizational conflict of interest provisions and/or includes contractual requirements for non-disclosure of proprietary contractor information or data/software marked with restrictive legends. The contractor, by submitting a proposal or entering into this contract, is deemed to have consented to the disclosure of its information to JAB Solutions, Quanterion Solutions, Inc., Booz Allen Hamilton, TASC, and Kforce Government Solutions, Inc. under the conditions and limitations described herein.

CLAUSES INCORPORATED BY FULL TEXT

252.215-9004 KEY PERSONNEL (AUG 2012)

The personnel listed below are considered essential to the work being performed hereunder. Prior to removing, replacing, or diverting any of the specified individuals, the Contractor shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this Contract. No deviation shall be made by the Contractor without the prior written consent of the Contracting Officer; provided, that the Contracting Officer authorizes in writing the change, such authorization shall constitute the consent of the Contracting Officer required by this paragraph. The personnel listed below may, with the consent of the contracting parties, be amended from time to time during the course of the Contract to either add or delete personnel as appropriate.

Principal Investigator

CLAUSES INCORPORATED BY FULL TEXT

252.216-9003 CONSULTANTS (OCT 1998)

Services of consultants shall be at rates and for periods approved in advance by the Contracting Officer. Requests for approval shall be submitted to the Contracting Officer sufficiently in advance of the need to use a consultant under this Contract. The request shall include (a) a copy of the proposed consultant agreement, (b) a brief biography of the consultant, and (c) an indication of the area(s) in which consultant's expertise will be utilized and why it is essential for contract performance. In addition, significant deviations from the dollar amount approved for consultant services, or changes in the consultants to be utilized, must likewise be approved in advance upon submission of adequate justification.

CLAUSES INCORPORATED BY FULL TEXT

252.223-9004 – Environmental, Radiation, Safety Notification, Compliance and Liability (JUN 2013)

(a) Environmental, Radiation, and Safety Notification: The Contractor shall notify the Contracting Officer (CO) and Contracting Officer Representative (COR) of any occurrence of non-compliance with Environmental, Radiation, and Safety regulations that occur at any of the Contractor's facilities at which government property is located as soon as practicable, but not later than 24 hours after identification of an incident. The Contractor shall make initial notification by telephone or email. Then, shall follow-up with a written report within 10 business days.

(b) The Contractor shall notify the CO/COR of any external Environmental, Radiation, and Safety audits or inspections conducted at the facility and provide any reports resulting from the audit. The final report shall be provided to the CO/COR within 30 days following the audit.

(c) The Contractor shall comply with all Federal, State, and local Environmental, Radiation, and Safety regulations, including, without limitation, statutes, ordinances, court orders, consent decrees, administrative orders, or compliance agreements applicable to the facilities where the Government Property is located.

(d) The Contractor shall acquire all necessary permits, and licenses.

(e) DTRA will not be responsible, financially or otherwise, for the investigation, monitoring, cleanup, containment, restoration, removal, or other remedial activity with respect to any hazardous substances present in the soil, ground water, or building(s) that (i) results from activities conducted by entities other than DTRA during the term of this contract, or (ii) results from activities conducted pursuant to any contract, lease, or occupancy agreement that is not associated with DTRA-owned property or activities.

(End of Clause)

CLAUSES INCORPORATED BY FULL TEXT

252.235-9000 SOURCES OF INFORMATION (JULY 2000)

a. The results of the research to be delivered to the Government under this Contract shall embody the most recent reliable information in the field which is available to the Contractor from private and governmental sources, and the Contractor agrees to utilize all sources of such information available to it. In this connection, information in this field which is in the control of DTRA shall, with the consent of the Contracting Officer's Representative (COR) and under such safeguards and procedures as he/she may prescribe, be made available to the Contractor on request. Additionally, the Contractor is encouraged to make use of the resources available through the Defense Threat Reduction Information Analysis Center (DTRIAC), 1680 Texas Street, Southeast, Kirtland AFB, New Mexico 87117.

b. Reasonable assistance in obtaining access to information, or in obtaining permission to use Government or private facilities, will be given to the Contractor by DTRA. Specifically, the Contractor must register with the Defense Technical Information Center, ATTN: DTIC, 8725 John J. Kingman Road, Suite 0944, Fort Belvoir, VA 22060-6218, in accordance with Defense Logistics Agency (DLA) Regulation 4185.10, Certification and Registration for Access to DoD Defense Technical Information. DD Form 1540, the registration form, shall be forwarded to the DTRA Contracting Officer for approval (DFARS 35.010(b)).
(End of clause)

CLAUSES INCORPORATED BY FULL TEXT

252.237-9001 - Enterprise-wide Contractor Manpower Reporting Application (APR 2013)

(a) In accordance with Section 2330a of title 10, United States Code (10 USC 2330a), Contractors shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract via a secure data collection site. The contractor shall completely fill in all required data fields using the following web address: http://www.ecmra.mil/.

(b) Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the help desk at: http://www.ecmra.mil.

(End of Clause)

252.242-9000 CONTRACTOR PERFORMANCE ASSESSMENT REPORTING SYSTEM (CPARS) (NOV 2002)

1. As required by FAR Part 42.1503, and DTRA policy for the Contractor Performance Assessment Reporting System (CPARS) and Past Performance Automated Information System (PPAIS) effective July, 2001, the Government shall complete a CPAR each year of the period of performance of this contract. The contractor will have an opportunity to provide their comments in each CPAR before it is finalized. In accordance with DTRA CPARS policy the completed CPARs will be entered into the Department of Defense Past Performance Automated Information System (PPAIS), a retrieval system for source selection teams to access the CPARs of contractors' performance. The DTRA CPARS and PPAIS policy includes an explanation of the process and procedures that will be utilized under this contract. A copy is available for contractor reference via the DTRAlink (www.dtra.mil) by accessing Acquisition, How We Do Business.

2. The CPARs shall occur annually in accordance with the schedule established below:

(i) Initial CPAR: 12 months after contract start date (date performance begins)
TBD (by PCO)

(ii) Interim CPAR(s) will be performed annually on the anniversary of the contract start date according to the following schedule:
TBD (by PCO)

(iii) A Final CPAR will be completed upon contract termination, transfer of program management/contract management responsibility outside of DTRA, the delivery of the final end item on contract and/or the completion of the performance period.

(iv) An Out-of-Cycle CPAR may be required when there is a significant change in performance that alters the assessment in one or more evaluation area(s). An Out-of-Cycle CPAR is optional and shall be processed in accordance with Attachment___

3. Each CPAR shall only cover the period elapsing from the last annual CPAR. The final CPAR shall not be used to summarize or "roll-up" the contractor's performance under the entire contract. Each annual CPAR and the final CPAR together will comprise a total picture of contractor performance.

4. At the request of the Government, a verbal, informal review of the Contractor's performance may be held 3-6 months before the completion of the Interim or Final Evaluation periods. This review entails discussing any problems or areas of concern regarding the Contractor's performance to date. No written evaluation form or other formal documentation is required for this evaluation. It may be conducted with the Contractor by telephone, teleconference or face-to-face. This is designed to offer the Contractor an opportunity to correct known deficiencies or weaknesses prior to the formal written evaluation.

5. As set forth in DTRA CPARS policy, any disagreements between the Contractor and the Program Manager regarding the CPAR(s) that cannot be resolved shall be reviewed by the designated Reviewing Official prior to finalization of the CPAR.

6. Special Requirements for Indefinite Delivery Contracts (IDIQ and Requirements type), CPARs shall be processed (select one)

____ for all existing orders (combined) at the time the CPAR is processed

____ on an order-by-order basis

____ on a grouped order basis

7. The policy and procedures set forth in this clause and DTRA CPARS policy are not subject to "Disputes" as described in FAR Part 33.

Section I - Contract Clauses

UPDATED CLAUSES

52.222-50 COMBATING TRAFFICKING IN PERSONS (MAR 2015)
52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (MAR 2015)
252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A COUNTRY THAT IS A STATE SPONSOR OF TERRORISM (DEC 2014)

CLAUSES INCORPORATED BY REFERENCE

52.202-1	Definitions	NOV 2013
52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	MAY 2014
52.203-6	Restrictions On Subcontractor Sales To The Government	SEP 2006
52.203-7	Anti-Kickback Procedures	MAY 2014
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	MAY 2014
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	MAY 2014
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	OCT 2010
52.203-17	Contractor Employee Whistleblower Rights and Requirement To Inform Employees of Whistleblower Rights	APR 2014
52.204-4	Printed or Copied Double-Sided on Postconsumer Fiber Content Paper	MAY 2011
52.204-10	Reporting Executive Compensation and First-Tier Subcontract Awards	JUL 2013
52.204-13	System for Award Management Maintenance	JUL 2013
52.204-18	Commercial and Government Entity Code Maintenance	NOV 2014
52.204-19	Incorporation by Reference of Representations and Certifications.	DEC 2014
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	AUG 2013
52.209-9	Updates of Publicly Available Information Regarding Responsibility Matters	JUL 2013
52.209-10	Prohibition on Contracting With Inverted Domestic Corporations	DEC 2014
52.215-2	Audit and Records--Negotiation	OCT 2010
52.215-2 Alt II	Audit and Records--Negotiation (Oct 2010) - Alternate II	APR 1998
52.215-8	Order of Precedence--Uniform Contract Format	OCT 1997
52.215-10	Price Reduction for Defective Certified Cost or Pricing Data	AUG 2011
52.215-12	Subcontractor Certified Cost or Pricing Data	OCT 2010
52.215-14	Integrity of Unit Prices	OCT 2010
52.215-15	Pension Adjustments and Asset Reversions	OCT 2010
52.215-17	Waiver of Facilities Capital Cost of Money	OCT 1997
52.215-18	Reversion or Adjustment of Plans for Postretirement Benefits (PRB) Other than Pensions	JUL 2005
52.215-19	Notification of Ownership Changes	OCT 1997
52.215-21	Requirements for Certified Cost or Pricing Data and Data Other Than Certified Cost or Pricing Data -- Modifications	OCT 2010
52.215-23	Limitations on Pass-Through Charges	OCT 2009
52.216-11	Cost Contract--No Fee	APR 1984

52.219-8	Utilization of Small Business Concerns	OCT 2014
52.219-9 ALT II (Dev)	Small Business Subcontracting Plan (Deviation 2013-O0014) - Alternate II	OCT 2014
52.219-16	Liquidated Damages-Subcontracting Plan	JAN 1999
52.222-3	Convict Labor	JUN 2003
52.222-21	Prohibition Of Segregated Facilities	FEB 1999
52.222-26	Equal Opportunity	MAR 2007
52.222-35	Equal Opportunity for Veterans	JUL 2014
52.222-36	Equal Opportunity for Workers with Disabilities	JUL 2014
52.222-37	Employment Reports on Veterans	JUL 2014
52.222-40	Notification of Employee Rights Under the National Labor Relations Act	DEC 2010
52.222-54	Employment Eligibility Verification	AUG 2013
52.223-6	Drug-Free Workplace	MAY 2001
52.223-18	Encouraging Contractor Policies To Ban Text Messaging While Driving	AUG 2011
52.225-13	Restrictions on Certain Foreign Purchases	JUN 2008
52.227-1 Alt I	Authorization And Consent (Dec 2007) - Alternate I	APR 1984
52.227-2	Notice And Assistance Regarding Patent And Copyright Infringement	DEC 2007
52.227-11 Alt II	Patent Rights--Ownership by the Contractor (May 2014) - Alternate II	DEC 2007
52.228-7	Insurance--Liability To Third Persons	MAR 1996
52.232-9	Limitation On Withholding Of Payments	APR 1984
52.232-17	Interest	MAY 2014
52.232-20	Limitation Of Cost	APR 1984
52.232-22	Limitation Of Funds	APR 1984
52.232-23 Alt I	Assignment of Claims (May 2014) - Alternate I	APR 1984
52.232-25 Alt I	Prompt Payment (July 2013) Alternate I	FEB 2002
52.232-39	Unenforceability of Unauthorized Obligations	JUN 2013
52.232-40	Providing Accelerated Payments to Small Business Subcontractors	DEC 2013
52.233-1 Alt I	Disputes (May 2014) - Alternate I	DEC 1991
52.233-3 Alt I	Protest After Award (Aug 1996) - Alternate I	JUN 1985
52.233-4	Applicable Law for Breach of Contract Claim	OCT 2004
52.242-1	Notice of Intent to Disallow Costs	APR 1984
52.242-3	Penalties for Unallowable Costs	MAY 2014
52.242-4	Certification of Final Indirect Costs	JAN 1997
52.242-13	Bankruptcy	JUL 1995
52.243-2 Alt V	Changes--Cost-Reimbursement (Aug 1987) - Alternate V	APR 1984
52.244-5	Competition In Subcontracting	DEC 1996
52.245-1	Government Property	APR 2012
52.245-9	Use And Charges	APR 2012
52.246-25	Limitation Of Liability--Services	FEB 1997
52.249-5	Termination For Convenience Of The Government (Educational And Other Nonprofit Institutions)	SEP 1996
52.251-1	Government Supply Sources	APR 2012
52.253-1	Computer Generated Forms	JAN 1991
252.203-7000	Requirements Relating to Compensation of Former DoD Officials	SEP 2011
252.203-7001	Prohibition On Persons Convicted of Fraud or Other Defense-Contract-Related Felonies	DEC 2008
252.203-7002	Requirement to Inform Employees of Whistleblower Rights	SEP 2013
252.204-7000	Disclosure Of Information	AUG 2013

252.204-7003	Control Of Government Personnel Work Product	APR 1992
252.204-7012	Safeguarding of Unclassified Controlled Technical Information	NOV 2013
252.205-7000	Provision Of Information To Cooperative Agreement Holders	DEC 1991
252.211-7007	Reporting of Government-Furnished Property	AUG 2012
252.215-7000	Pricing Adjustments	DEC 2012
252.215-7002	Cost Estimating System Requirements	DEC 2012
252.219-7003	Small Business Subcontracting Plan (DOD Contracts)	OCT 2014
252.222-7006	Restrictions on the Use of Mandatory Arbitration Agreements	DEC 2010
252.225-7012	Preference For Certain Domestic Commodities	FEB 2013
252.225-7048	Export-Controlled Items	JUN 2013
252.226-7001	Utilization of Indian Organizations and Indian-Owned Economic Enterprises, and Native Hawaiian Small Business Concerns	SEP 2004
252.227-7013	Rights in Technical Data--Noncommercial Items	FEB 2014
252.227-7014	Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation	FEB 2014
252.227-7016	Rights in Bid or Proposal Information	JAN 2011
252.227-7019	Validation of Asserted Restrictions--Computer Software	SEP 2011
252.227-7027	Deferred Ordering Of Technical Data Or Computer Software	APR 1988
252.227-7030	Technical Data--Withholding Of Payment	MAR 2000
252.227-7037	Validation of Restrictive Markings on Technical Data	JUN 2013
252.227-7039	Patents--Reporting Of Subject Inventions	APR 1990
252.231-7000	Supplemental Cost Principles	DEC 1991
252.232-7010	Levies on Contract Payments	DEC 2006
252.235-7011	Final Scientific or Technical Report	NOV 2004
252.242-7006	Accounting System Administration	FEB 2012
252.243-7002	Requests for Equitable Adjustment	DEC 2012
252.244-7000	Subcontracts for Commercial Items	JUN 2013
252.244-7001	Contractor Purchasing System Administration	MAY 2014
252.245-7001	Tagging, Labeling, and Marking of Government-Furnished Property	APR 2012
252.245-7002	Reporting Loss of Government Property	APR 2012
252.245-7003	Contractor Property Management System Administration	APR 2012
252.245-7004	Reporting, Reutilization, and Disposal	MAY 2013
252.247-7023	Transportation of Supplies by Sea	APR 2014
252.247-7024	Notification Of Transportation Of Supplies By Sea	MAR 2000
252.251-7000	Ordering From Government Supply Sources	AUG 2012

CLAUSES INCORPORATED BY FULL TEXT

52.216-7 ALLOWABLE COST AND PAYMENT (JUN 2013)

(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but (except for small business concerns) not more often than once every 2 weeks, in amounts determined to be allowable by the Contracting Officer in accordance with Federal Acquisition Regulation (FAR) subpart 31.2 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25.

(3) The designated payment office will make interim payments for contract financing on the 30th day after the designated billing office receives a proper payment request.

In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs. (1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (b)(2) of the clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made--

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of financing payments that have been paid by cash, check, or other forms of payment to subcontractors.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates. (1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(iii) An adequate indirect cost rate proposal shall include the following data unless otherwise specified by the cognizant Federal agency official:

(A) Summary of all claimed indirect expense rates, including pool, base, and calculated indirect rate.

(B) General and Administrative expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts).

(C) Overhead expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) for each final indirect cost pool.

(D) Occupancy expenses (intermediate indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) and expense reallocation to final indirect cost pools.

(E) Claimed allocation bases, by element of cost, used to distribute indirect costs.

(F) Facilities capital cost of money factors computation.

(G) Reconciliation of books of account (i.e., General Ledger) and claimed direct costs by major cost element.

(H) Schedule of direct costs by contract and subcontract and indirect expense applied at claimed rates, as well as a subsidiary schedule of Government participation percentages in each of the allocation base amounts.

(I) Schedule of cumulative direct and indirect costs claimed and billed by contract and subcontract.

(J) Subcontract information. Listing of subcontracts awarded to companies for which the contractor is the prime or upper-tier contractor (include prime and subcontract numbers; subcontract value and award type; amount claimed during the fiscal year; and the subcontractor name, address, and point of contact information).

(K) Summary of each time-and-materials and labor-hour contract information, including labor categories, labor rates, hours, and amounts; direct materials; other direct costs; and, indirect expense applied at claimed rates.

(L) Reconciliation of total payroll per IRS form 941 to total labor costs distribution.

(M) Listing of decisions/agreements/approvals and description of accounting/organizational changes.

(N) Certificate of final indirect costs (see 52.242-4,
Certification of Final Indirect Costs).

(O) Contract closing information for contracts physically completed in this fiscal year (include contract number, period of performance, contract ceiling amounts, contract fee computations, level of effort, and indicate if the contract is ready to close).

(iv) The following supplemental information is not required to determine if a proposal is adequate, but may be required during the audit process:

(A) Comparative analysis of indirect expense pools detailed by account to prior fiscal year and budgetary data.

(B) General organizational information and limitation on allowability of compensation for certain contractor personnel. See 31.205-6(p). Additional salary reference information is available at http://www.whitehouse.gov/omb/procurement_index_exec_comp/.

(C) Identification of prime contracts under which the contractor performs as a subcontractor.

(D) Description of accounting system (excludes contractors required to submit a CAS Disclosure Statement or contractors where the description of the accounting system has not changed from the previous year's submission).

(E) Procedures for identifying and excluding unallowable costs from the costs claimed and billed (excludes contractors where the procedures have not changed from the previous year's submission).

(F) Certified financial statements and other financial data (e.g., trial balance, compilation, review, etc.).

(G) Management letter from outside CPAs concerning any internal control weaknesses.

(H) Actions that have been and/or will be implemented to correct the weaknesses described in the management letter from subparagraph G) of this section.

(I) List of all internal audit reports issued since the last disclosure of internal audit reports to the Government.

(J) Annual internal audit plan of scheduled audits to be performed in the fiscal year when the final indirect cost rate submission is made.

(K) Federal and State income tax returns.

(L) Securities and Exchange Commission 10-K annual report.

(M) Minutes from board of directors meetings.

(N) Listing of delay claims and termination claims submitted which contain costs relating to the subject fiscal year.

(O) Contract briefings, which generally include a synopsis of all pertinent contract provisions, such as: Contract type, contract amount, product or service(s) to be provided, contract performance period, rate ceilings, advance approval requirements, pre-contract cost allowability limitations, and billing limitations.

(v) The Contractor shall update the billings on all contracts to reflect the final settled rates and update the schedule of cumulative direct and indirect costs claimed and billed, as required in paragraph (d)(2)(iii)(I) of this section, within 60 days after settlement of final indirect cost rates.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates. The completion invoice or voucher shall include settled subcontract amounts and rates. The prime contractor is responsible for settling subcontractor amounts and rates included in the completion invoice or voucher and providing status of subcontractor audits to the contracting officer upon request.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may--

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) Adjusted for prior overpayments or underpayments.

(h) Final payment. (1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(5) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts

are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.216-7 ALLOWABLE COST AND PAYMENT (JUN 2013) -- ALTERNATE IV (AUG 2012)
(a) Invoicing.

(1) The Government will make payments to the Contractor when requested as work progresses, but not more often than once every two weeks, in amounts determined to be allowable by the Contracting Officer in accordance with FAR subpart 31.7 in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(2) Contract financing payments are not subject to the interest penalty provisions of the Prompt Payment Act. Interim payments made prior to the final payment under the contract are contract financing payments, except interim payments if this contract contains Alternate I to the clause at 52.232-25.

(3) The designated payment office will make interim payments for contract financing on the 30th day after the designated billing office receives a proper payment request.

In the event that the Government requires an audit or other review of a specific payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date.

(b) Reimbursing costs. (1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (b)(2) of the clause, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Supplies and services purchased directly for the contract and associated financing payments to subcontractors, provided payments determined due will be made--

(1) In accordance with the terms and conditions of a subcontract or invoice; and

(2) Ordinarily within 30 days of the submission of the Contractor's payment request to the Government;

(B) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(C) Direct labor;

(D) Direct travel;

(E) Other direct in-house costs; and

(F) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of financing payments that have been paid by cash, check, or other forms of payment to subcontractors.

(2) Accrued costs of Contractor contributions under employee pension plans shall be excluded until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's indirect costs for payment purposes).

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) of this clause, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) of this clause.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may receive more frequent payments than every 2 weeks.

(d) Final indirect cost rates. (1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2)(i) The Contractor shall submit an adequate final indirect cost rate proposal to the Contracting Officer (or cognizant Federal agency official) and auditor within the 6-month period following the expiration of each of its fiscal years. Reasonable extensions, for exceptional circumstances only, may be requested in writing by the Contractor and granted in writing by the Contracting Officer. The Contractor shall support its proposal with adequate supporting data.

(ii) The proposed rates shall be based on the Contractor's actual cost experience for that period. The appropriate Government representative and the Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(iii) An adequate indirect cost rate proposal shall include the following data unless otherwise specified by the cognizant Federal agency official:

(A) Summary of all claimed indirect expense rates, including pool, base, and calculated indirect rate.

(B) General and Administrative expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts).

(C) Overhead expenses (final indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) for each final indirect cost pool.

(D) Occupancy expenses (intermediate indirect cost pool). Schedule of claimed expenses by element of cost as identified in accounting records (Chart of Accounts) and expense reallocation to final indirect cost pools.

(E) Claimed allocation bases, by element of cost, used to distribute indirect costs.

(F) Facilities capital cost of money factors computation.

(G) Reconciliation of books of account (i.e., General Ledger) and claimed direct costs by major cost element.

(H) Schedule of direct costs by contract and subcontract and indirect expense applied at claimed rates, as well as a subsidiary schedule of Government participation percentages in each of the allocation base amounts.

(I) Schedule of cumulative direct and indirect costs claimed and billed by contract and subcontract.

(J) Subcontract information. Listing of subcontracts awarded to companies for which the contractor is the prime or upper-tier contractor (include prime and subcontract numbers; subcontract value and award type; amount claimed during the fiscal year; and the subcontractor name, address, and point of contact information).

(K) Summary of each time-and-materials and labor-hour contract information, including labor ategories, labor rates, hours, and amounts; direct materials; other direct costs; and, indirect expense applied at claimed rates.

(L) Reconciliation of total payroll per IRS form 941 to total labor costs distribution.

(M) Listing of decisions/agreements/approvals and description of accounting/organizational changes.

(N) Certificate of final indirect costs (see 52.242-4,
Certification of Final Indirect Costs).

(O) Contract closing information for contracts physically completed in this fiscal year (include contract number, period of performance, contract ceiling amounts, contract fee computations, level of effort, and indicate if the contract is ready to close).

(iv) The following supplemental information is not required to determine if a proposal is adequate, but may be required during the audit process:

(A) Comparative analysis of indirect expense pools detailed by account to prior fiscal year and budgetary data.
(B) General organizational information and limitation on allowability of compensation for certain contractor personnel. See 31.205-6(p). Additional salary reference information is available at http://www.whitehouse.gov/omb/procurement_index_exec_comp/.

(C) Identification of prime contracts under which the contractor performs as a subcontractor.

(D) Description of accounting system (excludes contractors required to submit a CAS Disclosure Statement or contractors where the description of the accounting system has not changed from the previous year's submission).

(E) Procedures for identifying and excluding unallowable costs from the costs claimed and billed (excludes contractors where the procedures have not changed from the previous year's submission).

(F) Certified financial statements and other financial data (e.g., trial balance, compilation, review, etc.).

(G) Management letter from outside CPAs concerning any internal control weaknesses.

(H) Actions that have been and/or will be implemented to correct the weaknesses described in the management letter from subparagraph G) of this section.

(I) List of all internal audit reports issued since the last disclosure of internal audit reports to the Government.

(J) Annual internal audit plan of scheduled audits to be performed in the fiscal year when the final indirect cost rate submission is made.

(K) Federal and State income tax returns.

(L) Securities and Exchange Commission 10-K annual report.

(M) Minutes from board of directors meetings.

(N) Listing of delay claims and termination claims submitted which contain costs relating to the subject fiscal year.

(O) Contract briefings, which generally include a synopsis of all pertinent contract provisions, such as: Contract type, contract amount, product or service(s) to be provided, contract performance period, rate ceilings, advance approval requirements, pre-contract cost allowability limitations, and billing limitations.

(v) The Contractor shall update the billings on all contracts to reflect the final settled rates and update the schedule of cumulative direct and indirect costs claimed and billed, as required in paragraph (d)(2)(iii)(I) of this section, within 60 days after settlement of final indirect cost rates.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agreed-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(5) Within 120 days (or longer period if approved in writing by the Contracting Officer) after settlement of the final annual indirect cost rates for all years of a physically complete contract, the Contractor shall submit a completion invoice or voucher to reflect the settled amounts and rates. The completion invoice or voucher shall include settled subcontract amounts and rates. The prime contractor is responsible for settling subcontractor amounts and rates

included in the completion invoice or voucher and providing status of subcontractor audits to the contracting officer upon request.

(6)(i) If the Contractor fails to submit a completion invoice or voucher within the time specified in paragraph (d)(5) of this clause, the Contracting Officer may--

(A) Determine the amounts due to the Contractor under the contract; and

(B) Record this determination in a unilateral modification to the contract.

(ii) This determination constitutes the final decision of the Contracting Officer in accordance with the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. Quick-closeout procedures are applicable when the conditions in FAR 42.708(a) are satisfied.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) Reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) Adjusted for prior overpayments or underpayments.

(h) Final payment. (1) Upon approval of a completion invoice or voucher submitted by the Contractor in accordance with paragraph (d)(5) of this clause, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts are properly allocable to costs for which the Contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided, that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

(End of clause)

52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)

(a) The Government may extend the term of this contract by written notice to the Contractor prior to the end of the Base Period; provided that the Government gives the Contractor a preliminary written notice of its intent to extend at least 30 days before the contract expires. The preliminary notice does not commit the Government to an extension.

(b) If the Government exercises this option, the extended contract shall be considered to include this option clause.

(c) The total duration of this contract, including the exercise of any options under this clause, shall not exceed 24 months.

(End of clause)

52.219-28 POST-AWARD SMALL BUSINESS PROGRAM REREPRESENTATION (JULY 2013)

(a) Definitions. As used in this clause--

Long-term contract means a contract of more than five years in duration, including options. However, the term does not include contracts that exceed five years in duration because the period of performance has been extended for a cumulative period not to exceed six months under the clause at 52.217-8, Option to Extend Services, or other appropriate authority.

Small business concern means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR part 121 and the size standard in paragraph (c) of this clause. Such a concern is ``not dominant in its field of operation'' when it does not exercise a controlling or major influence on a national basis in a kind of business activity in which a number of business concerns are primarily engaged. In determining whether dominance exists, consideration shall be given to all appropriate factors, including volume of business, number of employees, financial resources, competitive status or position, ownership or control of materials, processes, patents, license agreements, facilities, sales territory, and nature of business activity.

(b) If the Contractor represented that it was a small business concern prior to award of this contract, the Contractor shall rerepresent its size status according to paragraph (e) of this clause or, if applicable, paragraph (g) of this clause, upon the occurrence of any of the following:

(1) Within 30 days after execution of a novation agreement or within 30 days after modification of the contract to include this clause, if the novation agreement was executed prior to inclusion of this clause in the contract.

(2) Within 30 days after a merger or acquisition that does not require a novation or within 30 days after modification of the contract to include this clause, if the merger or acquisition occurred prior to inclusion of this clause in the contract.

(3) For long-term contracts--

(i) Within 60 to 120 days prior to the end of the fifth year of the contract; and

(ii) Within 60 to 120 days prior to the date specified in the contract for exercising any option thereafter.

(c) The Contractor shall rerepresent its size status in accordance with the size standard in effect at the time of this rerepresentation that corresponds to the North American Industry Classification System (NAICS) code assigned to this contract. The small business size standard corresponding to this NAICS code can be found at http://www.sba.gov/content/table-small-business-size-standards.

(d) The small business size standard for a Contractor providing a product which it does not manufacture itself, for a contract other than a construction or service contract, is 500 employees.

(e) Except as provided in paragraph (g) of this clause, the Contractor shall make the representation required by paragraph (b) of this clause by validating or updating all its representations in the Representations and Certifications section of the System for Award Management (SAM) and its other data in SAM, as necessary, to ensure that they reflect the Contractor's current status. The
Contractor shall notify the contracting office in writing within the timeframes specified in paragraph (b) of this clause that the data have been validated or updated, and provide the date of the validation or update.

(f) If the Contractor represented that it was other than a small business concern prior to award of this contract, the Contractor may, but is not required to, take the actions required by paragraphs (e) or (g) of this clause.

(g) If the Contractor does not have representations and certifications in SAM, or does not have a representation in SAM for the NAICS code applicable to this contract, the Contractor is required to complete the following rerepresentation and submit it to the contracting office, along with the contract number and the date on which the rerepresentation was completed:

The Contractor represents that it ( ) is, (X) is not a small business concern under NAICS Code 541711- assigned to contract number HDTRA1-15-C-0041.

(Contractor to sign and date and insert authorized signer's name and title).

(End of clause)

52.222-2 PAYMENT FOR OVERTIME PREMIUMS (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed $0.00 or the overtime premium is paid for work --

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

* Insert either "zero" or the dollar amount agreed to during negotiations. The inserted figure does not apply to the exceptions in paragraph (a)(1) through (a)(4) of the clause.

(End of clause)

52.244-2 SUBCONTRACTS (OCT 2010)

(a) Definitions. As used in this clause--

Approved purchasing system means a Contractor's purchasing system that has been reviewed and approved in accordance with Part 44 of the Federal Acquisition Regulation (FAR).

Consent to subcontract means the Contracting Officer's written consent for the Contractor to enter into a particular subcontract.

Subcontract means any contract, as defined in FAR Subpart 2.1, entered into by a subcontractor to furnish supplies or services for performance of the prime contract or a subcontract. It includes, but is not limited to, purchase orders, and changes and modifications to purchase orders.

(b) When this clause is included in a fixed-price type contract, consent to subcontract is required only on unpriced contract actions (including unpriced modifications or unpriced delivery orders), and only if required in accordance with paragraph (c) or (d) of this clause.

(c) If the Contractor does not have an approved purchasing system, consent to subcontract is required for any subcontract that—

(1) Is of the cost-reimbursement, time-and-materials, or labor-hour type; or

(2) Is fixed-price and exceeds—

(i) For a contract awarded by the Department of Defense, the Coast Guard, or the National Aeronautics and Space Administration, the greater of the simplified acquisition threshold or 5 percent of the total estimated cost of the contract; or

(ii) For a contract awarded by a civilian agency other than the Coast Guard and the National Aeronautics and Space Administration, either the simplified acquisition threshold or 5 percent of the total estimated cost of the contract.

(d) If the Contractor has an approved purchasing system, the Contractor nevertheless shall obtain the Contracting Officer's written consent before placing the following subcontracts:

(e)(1) The Contractor shall notify the Contracting Officer reasonably in advance of placing any subcontract or modification thereof for which consent is required under paragraph (b), (c), or (d) of this clause, including the following information:

(i) A description of the supplies or services to be subcontracted.

(ii) Identification of the type of subcontract to be used.

(iii) Identification of the proposed subcontractor.

(iv) The proposed subcontract price.

(v) The subcontractor's current, complete, and accurate certified cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions.

(vi) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract.

(vii) A negotiation memorandum reflecting—

(A) The principal elements of the subcontract price negotiations;

(B) The most significant considerations controlling establishment of initial or revised prices;

(C) The reason certified cost or pricing data were or were not required;

(D) The extent, if any, to which the Contractor did not rely on the subcontractor's certified cost or pricing data in determining
the price objective and in negotiating the final price;

(E) The extent to which it was recognized in the negotiation that the subcontractor's certified cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and the subcontractor; and the effect of any such defective data on the total price negotiated;

(F) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(G) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(2) The Contractor is not required to notify the Contracting Officer in advance of entering into any subcontract for which consent is not required under paragraph (c), (d), or (e) of this clause.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination—

(1) Of the acceptability of any subcontract terms or conditions;

(2) Of the allowability of any cost under this contract; or

(3) To relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract or modification thereof placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement type subcontracts shall not exceed the fee limitations in FAR 15.404-4(c)(4)(i).

(h) The Contractor shall give the Contracting Officer immediate written notice of any action or suit filed and prompt notice of any claim made against the Contractor by any subcontractor or vendor that, in the opinion of the Contractor, may result in litigation related in any way to this contract, with respect to which the Contractor may be entitled to reimbursement from the Government.

(i) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

(j) Paragraphs (c) and (e) of this clause do not apply to the following subcontracts, which were evaluated during negotiations:

Kitware, Inc.
International Society for Infectious Diseases

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil

(End of clause)

52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Defense Acquisition Regulations System, Department Of Defense (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

252.204-9004 IMPLEMENTATION OF DISCLOSURE OF INFORMATION (AUG 2014)

In accordance with DFARS 252.204-7000 Disclosure of Information, any information to be released shall be submitted at least 10 days before the proposed release date, for security and policy review. Submit one copy to each below:

(a) Office of Public Affairs, DTRA/J0XGP, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(b) Contracting Officer, Brian Nuckols, DTRA/J4CRC, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(c) Program Manager, Christopher Kiley, DTRA/J9CB, 8725 John J. Kingman Dr, MS 6201, Ft Belvoir VA 22060-6201.

(End of Clause)

252.235-7010 Acknowledgment of Support and Disclaimer. (MAY 1995)

(a) The Contractor shall include an acknowledgment of the Government's support in the publication of any material based on or developed under this contract, stated in the following terms: This material is based upon work supported by the Defense Threat Reduction Agency under Contract No. HDTRA1-15-C-0041.

(b) All material, except scientific articles or papers published in scientific journals, must, in addition to any notices or disclaimers by the Contractor, also contain the following disclaimer: Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Defense Threat Reduction Agency.

(End of clause)

252.245-9000 Government Property (MAY 2013)

(a) In accordance with FAR 52.245-1(b), Property Management, and FAR 52.245-1(f), Contractor Plans and Systems, the Contractor shall have a system to manage (control, use, preserve, protect, repair and maintain) Government property in its possession.

(b) The Contractor shall complete and return the applicable attachment(s) electronically:

i. Requisitioned Government-Furnished Property (RGFP) to include the following:

If Non-Reimbursable:	If Reimbursable:
Item#	Item#
Description	Description
CAGE Code	S Limit Authorized
Marking Instrument	Marking Instrument
NSN	NSN
Nomen	Nomen
Part or Indent#	Part or Indent
Quantity	Quantity
Type Designator	Unit of Measure
Unite Acquisition Cost	Use As Is

Unit of Measure
Use As Is

ii. Scheduled Government-Furnished Property (SGFP) to include the following:

If Serialized Items List:	If Non –Serialized Items List:
Item#	Item#
Description	Description
CAGE	CAGE
Marking Instrument	Marking Instrument
Model#	Model#
NSN	NSN
Nomen	Nomen
Part#	Part#
Part or Indent#	Part or Indent
Quantity	Quantity
Serial#	Type Designator
Type Designator	Unit Acquisition Cost
Unit Acquisition Cost	Unit of Measure
Unit of Measure	Use As Is
Use As Is	

The electronic property links are as follows:

Requisitioned Government-Furnished Property (RGFP):
http://www.acq.osd.mil/dpap/pdi/pc/docs/RequisitionedGovernmentFurnishedPropertyFORM.pdf

Scheduled Government-Furnished Property (SGFP):
http://www.acq.osd.mil/dpap/pdi/pc/docs/ScheduledGovernmentFurnishedPropertyFORM.pdf

(c) The Government Site Visits/Physical Inventory – The DTRA will annually verify the Property in the Possession of the Contractor. The Contactor's Point of Contact shall coordinate with the Program Manager/Contracting Officer Representative or DTRA Accountable Property Officer (APO) on prearranged site visits upon request.

(d) The physical inventory report shall be validated/confirmed via signature by both the Contractor's Property Administrator and the DTRA's Government Representative (i.e. COR, APO, etc.). Inventory discrepancies must be reported immediately to the Contracting Officer, COR/Program Manager and resolved by the DTRA APO.

(e) Inventory Disposal Schedule – When applicable, the Contractor shall submit the inventory disposal schedule to the DTRA Logistics Office (DTRA J4L) for approval 45 days prior to submission of an inventory disposal schedule to the Plant Clearance Officer.

(End of Clause)

252.203-7999
Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements. (DEVIATION 2015-O0010)(FEB 2015)

(a) The Contractor shall not require employees or subcontractors seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or contactors from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(b) The Contractor shall notify employees that the prohibitions and restrictions of any internal confidentiality agreements covered by this clause are no longer in effect.

(c) The prohibition in paragraph (a) of this clause does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(d)(1) In accordance with section 743 of Division E, Title VIII, of the Consolidated and Further Continuing Resolution Appropriations Act, 2015, (Pub. L. 113-235), use of funds appropriated (or otherwise made available) under that or any other Act may be prohibited, if the Government determines that the Contractor is not in compliance with the provisions of this clause.

(2) The Government may seek any available remedies in the event the Contractor fails to perform in accordance with the terms and conditions of the contract as a result of Government action under this clause.

(End of clause)

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	CDRLs	6	08-APR-2015
Attachment 1	Statement of Work	3	13-MAR-2015
Attachment 2	Subcontracting Plan	6	27-MAR-2015
Attachment 3	Data Rights Assertion List	1	12-SEP-2014

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A001	Project Spend Plan		18 ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-81468	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	N/A	See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

16. REMARKS

1. Submission shall be furnished electronically via e-mail in contractor format
2. First submission within 30 days of contract award. Updates to be made annually.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6)	4/8/2015	(b)(6)	4/8/2015
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A002	Meeting/Teleconference Minutes		18 ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-ADMN-81505	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		N/A	N/A

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

16. REMARKS

BLOCK 10: Frequency depends on number of meetings and teleconfernces

BLOCK 12: The contractor shall provide meeting minutes within 7 days after all meetings/teleconferences.

The minutes shall be provided via email in Microsoft Office compatible format.

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6) S&T Manager	4/8/2015	(b)(6) (b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP ____ TM ____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A003	Monthly Progress & Cost Status Report	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80555A	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		Monthly	5 calendar days after month's end

8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A	Contract Award	5 calendar days after end of each month

16.REMARKS

The Monthly Progress & Cost Status Report shall highlight the technical progress made during the previous month, as well as provide quantitative estimates of cost, performance, and schedule, by month.

BLOCK 4: Paragraphs, subparagraphs, and line items described in DI-MGMT-80555A may be omitted or edited for appropriateness with prior approval from the Contracting Office. Please provide final recommended content and format to the contracting office with the response to the fact finding letter.

Monthly Progress Reports shall be provided via email in Microsoft Office compatible format to the Contracting Officer's Representative (COR).

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

17. PRICE GROUP
18 ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager	4/8/2015	(b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A004	Patents - Reporting of Subject Inventions	N/A

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
		See Block 16	See Block 16

16. REMARKS

16. REMARKS

Invention Disclosures/Patents – Subject Inventions Disclosures and Reports in accordance with either DFARS 252.227-7039 (Patents – Reporting of Subject Inventions)/FAR 52.227-11 (Patent Rights – Ownership by the Contractor) or DFARS 252.227-7038 (Patent Rights – Ownership by the Contractor) (Large Business) : (1) Provide copies of invention disclosures for subject inventions within 2 months of an employee inventor reporting a subject invention to the Contractor (or, for large businesses, within 6 months after the Contractor first becomes aware that a subject invention has been made, whichever is earlier); (2) submit DD Form 882 every 12 months from the date of the contract award, even if no inventions are made during that period; (3) submit DD Form 882 in a final report, even if no inventions are made during the contract term; (4) submit a written statement of Contractor's election whether or not to retain ownership in a subject invention within 2 years of providing the invention disclosure, or, if any publication, on sale or public use of the subject invention has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, not later than 60 days prior to the end of the statutory period; (5) provide a copy of either a filed provisional or a filed nonprovisional patent application on an elected subject invention within 1 year after the election of title of the subject invention, or within the 1-year statutory period if it has been initiated, with an acknowledgement of government rights in the specification as identified at 37 C.F.R. § 401.14(f)(4), (6) provide a copy of a filed nonprovisional patent application on an elected subject invention within 10 months after filing the provisional patent application on the elected subject invention; and (7) provide for every subject invention upon which a patent application has been filed or a patent issued, a nonexclusive, nontransferable, irrevocable, paid-up license to the Government to practice, or have practiced for or on its behalf, the subject invention throughout the world, and an irrevocable power to inspect and make copies of the patent application file.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6), S&T Manager	4/8/2015	(b)(6) (b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option 1)	A	TDP ____ TM ____ OTHER Software

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A005	Computer Software Product	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

16. REMARKS

The contractor will deliver software that can interface with the Biosurveillance Ecosystem (BSVE) and should include both source and executable codes. The software deliverables will be the following:

Within 12 months of contract award:

- Connect GRITS Girder database to the BSVE
- Prototype GRITS event recommendations and filtering
- Connect GRITS diagnostic and text-mining APIs to the BSVE
- Build BSVE interface to GRITS with the SDK
- Build mechanisms to crowdsource annotations
- Incorporate disease network graphs to assist diagnostics
- Support diagnostic algorithm development with dashboard
- Populated EDIR database
- Crowdsourced labels and annotations

Within 24 months of contract award:

- Expand diagnostic capability to arbitrary data feeds
- Connect GRITS to EIDR/Mantle
- Update diagnostic model in near-realtime
- Use text mining to extend network graphs/ontologies
- Connect EIDR collective intelligence editor to the BSVE
- Connect GRITS diagnostic data filtering to the BSVE
- Generate disease summary reports from diagnostics
- Forecast disease emergence
- Expanded EDIR database

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA/J4LP	0	1	0
DTRA/J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) (b)(6) S&T Manager	4/8/2015	(b)(6) (b)(6) S&T Manager	4/8/2015

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
0002 (Base) & 1002 (Option I)	A	TDP _____ TM _____ OTHER Reports

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	HDTRA1-15-C-0041	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A006	Scientific and Technical Reports	

4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

Blk 4-5: Per DID referenced elements, contractor format is acceptable. Report shall detail all work performed under this effort, including the results of analysis, and appropriate conclusions and/or recommendations. Dataset compatible with Microsoft Excel or contractor recommended database application.

A final technical report is required by the end of the base period. Updates to this report will be required at the end of the Option Year, if exercised. The report should include the following elements:

1) A description of the research and development processes used to arrive at the results of the study
2) A detailed compilation of the results generated
3) A description of the performance characteristics of the developed software and an analysis of its likely utility for additional development and deployment
4) Recommendations for the next stages of development
5) Description of what data are required to feed the delivered alorithms and an approach for the Government to maintain access to those data feeds.

Additionally, the contractor will deliver:

- Feedback on diagnostic dashboard (Updates provided each 12 months)
- Documentation on near-realtime architecture (24 months after contract award)
- Documentation for GRITS APIs (Updates provided each 12 months)

Blk 14: Submission by electronic media is preferred; E-mail, or CD ROM in a current version of Microsoft or Adobe products readable by the COR.

14. DISTRIBUTION	b. COPIES		
a. ADDRESSEE	Draft	Final	
		Reg	Repro
	0	1	0
DTRA/ J4LP	0	1	0
DTRA/ J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6)	4/8/2015	(b)(6)	4/8/2015
(b)(6) S&T Manager		(b)(6) S&T Manager	

Statement of Work

1.0 - Objective:
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance, disease ecology, and open source communities.

2.0 - Scope:
The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital disease surveillance, animal and human biosurveillance data, spatial environmental health data, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid and accurate diagnosis of outbreaks to identify disease threats more rapidly than current methods of digital disease surveillance and to help BSVE analysts constrain complex infectious disease outbreak scenarios.

Major milestones:
1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowd source annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to EIDR and Mantle
5. Crowd source improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Forecast disease emergence spatially

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:
Task 1: Connect GRITS Girder database to the BSVE (Base Period)
1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API

5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations (Base Period)

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics (Base Period)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard (Base Period)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to EIDR/Mantle (Option Year 1)

1. Evaluate existing EIDR/Mantle API against needs of recommendation system
2. Develop capacity of EIDR/Mantle API to deliver historic event matches
3. Recommend EIDR/Mantle events (e.g., current event is similar to past outbreak)
4. Use EIDR/Mantle media to improve diagnostics and recommendation quality
5. Match GRITS data to events in EIDR and Mantle (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g., EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g., novel diseases, viral strains that have mutated, bacteria that have developed antibiotic resistance).

Task 12: Connect EIDR collective intelligence editor to the BSVE (Option Year 1)

1. Evaluate and implement changes to EIDR API for of GRITS diagnostic needs
2. Generate keywords and rules from EIDR data to incorporate into GRITS text mining
3. Incorporate EIDR data into diagnostic model training
4. Design user interface for expert review and editing of EIDR events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with EIDR

Task 13: Connect GRITS diagnostic data filtering to the BSVE (Option Year 1)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics (Option Year 1)

1. Create algorithms for generating statistics (e.g., case counts) and visualizations (e.g., epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence (Option Year 1)

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

- Project Spend Plan (In accordance with Exhibt A Contract Data Requirements List)
- Meeting and Teleconference Minutes (In accordance with Exhibt A Contract Data Requirements List)
- Monthly Progress & Cost Status Reports (In accordance with Exhibt A Contract Data Requirements List)
- Software (In accordance with Exhibt A Contract Data Requirements List)
- Reports (In accordance with Exhibt A Contract Data Requirements List)

March 26, 2015

EcoHealth Alliance Subcontracting Plan for HDTRA114-AMD1-CBA-03-2-0022

Per FAR 19.704, we have detailed below our individual subcontracting plan to maximize small business potential in our contracting efforts for Base Year, Option Year 1.

Table 1. Estimated Proposed Subcontracting Amounts for Base Year of Contract

Socioeconomic Concern	Base Year Amount Subcontracted to Small Business	Option 1 Amount Subcontracted to Small Business	Base Year Percentage of overall value of total Base Year contract (Small business subcontracted amount /Total contract amount)	Option Year 1 Percentage of overall value of total Option 1 Year contract (Small business subcontracted amount /Total contract amount)
Small Business (including ANC and Indian Tribes)	$506,686.72	$521,887.33	21%	21%
Veteran-owned small business	$0	$0	0%	0%
Service-Disabled Veteran Owned Small Business -	$0	$0	0%	0%
Service-Disabled Veteran Owned Small Business	$0	$0	0%	0%
HUBZone Small Business -	$0	$0	0%	0%
Small Disadvantaged Business (including ANCs and Indian tribes)	$0	$0	0%	0%
Women-Owned Small Business Concerns	$0	$0	0%	0%

1) The breakdown of our percentage goals for subcontracted dollars for the **Base Year** is as follows

- Small Business (including ANCs and Indian Tribes)- 20%
- Veteran-owned small business - 0%
- Service-Disabled Veteran owned Small Businesses- 0%
- HUBzone Small Business - 0%
- Small Disadvantaged Business (including ANCs and Indian tribes) - 0%
- Women-owned Small Business Concerns - 0%

The breakdown of our percentage goals for subcontracted dollars for **Option Year 1** is as follows

- Small Business (including ANCs and Indian Tribes)- 20%
- Veteran-owned small business - 0%
- Service-Disabled Veteran owned Small Businesses- 0%
- HUBzone Small Business - 0%
- Small Disadvantaged Business (including ANCs and Indian tribes) - 0%
- Women-owned Small Business Concerns - 0%

2) The total amount of dollars to be subcontracted for this proposal in the **Base year** is $631,208.71. EcoHealth Alliance (EHA) plans to subcontract $506, 686.72 in the Base Year to Small Businesses (Kitware). This is approximately 80% of all subcontracted dollars. This small business is not an ANC or Indian Tribe. EHA plans to subcontract $0 to veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business (including ANCs and Indian tribes) and women-owned small business concerns.

The total amount of dollars to be subcontracted for this proposal in **Option Year 1** is $650,144.98. EHA plans to subcontract $521,887.33 in the Option Year 1 to Small Businesses (Kitware). This is approximately 80% of all subcontracted dollars. This small business is not an ANC or Indian Tribe. EHA plans to subcontract $0 to veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business (including ANCs and Indian tribes) and women-owned small business concerns.

(3) Supplies and services to be contracted to our small business subcontractor (Kitware) includes machine learning, text analysis, software development, data management, and data visualization. Kitware is a unique scientific organization, selected on the basis of the nature of the work, good faith efforts to identify capable small business firms, and the precedent of successful prior collaborations with EHA. Specifically, they were selected on the basis of professional accomplishments, niche expertise, proven track record, and the precedent of previously having developed custom biosurveillance products to interfaced with their products and expertise.

(4) The total and categorical percentage awards are lower than DoD's goals due to the specialized work to be completed the proposed work and the previous collaboration with subcontractors on previous and related research and development contracts with EHA (funded by DTRA). These methods are used to develop subcontracting goals:

The Principal Investigator (PI; Dr. Andrew G. Huff) will consult with the Chief Financial Officer (CFO; Mr. Harvey Kasdan), to clearly identify the goods and services that will be subcontracted and will search source lists to identify small, disadvantaged, women-owned, SBA HUBzone, veteran owned, and service disabled veteran owned firms that can provide these goods and services. EHA will investigate the identified firms' capabilities and the past performance of these firms to determine if they are qualified to provide the goods and services required. If there are qualified small, disadvantaged, women-owned, SBA HUBzone, veteran owned, or service disabled veteran owned firms that offer the needed goods or services, they will be used whenever possible. Reasonable goals are established before considering the value of the needed subcontracts and the after identifying the pool of qualified firms.

(5) The internal identification and selection process for subcontractors are as follows:

1. Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions.
2. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to determine their capacity, and their local relationships. Extensive review includes CV's of principal investigators and their staff, organizational and administrative capacity, annual report and audit report reviews, indirect cost rate review, and history of the institution.
3. We conduct a complete review of prospective subcontractors among senior staff, with a recommendation to the President for final decision.
4. Source lists used in making the determinations:
    - www.pro-net.sba.gov, the SBA online database of small businesses
    - www.sba.gov/hubzone, the SBA online database of locations that qualify as HUBZones
    - Local Office of the Small Business Administration

(6) Indirect costs were not included in our goals. Kitware and ISDS have their own approved overhead and indirect rates. Their sub-award contains overhead and indirect rates.

(7)

Name:	Dr. Andrew G. Huff
Title:	Senior Scientist
Address:	460 West 34th Street 17th Floor New York, NY 10001
Telephone Number:	1.212.380.4497 (direct)
Email:	huff@ecohealthalliance.org

Specific duties as they relate to EHA's subcontracting program are:

- Identifies potential subcontractors based on the methods described above
- Survey's SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned businesses for potential inclusion in all solicitations for products or services which they are capable of providing
- Works with finance and administration departments to identify future subcontracting goals
- Coordinates with subcontractors and assures subcontracting reports are submitted in accordance with EHA and U.S. government policies
- Prepares and submits periodic subcontracting reports as outlined in this plan

(8) EHA gives careful consideration to small businesses that could provide the services we require. On this basis, we identified one recognized small business entity in the field (Kitware) that had the ability, expertise and the capacity to accomplish these goals and that would be able to compliment the expertise of our organization to accomplish the tasks detailed in our statement of work (SOW). Per FAR 19.703 (2)(b), we rely on written documentation to confirm a subcontractor's status as a small business. Due to the scientifically specific nature of the work that is proposed, we were unable, to the best of our ability, to identify areas of the work that could be further subcontracted, or qualified firms that could help EHA achieve our broader small business goals (e.g., veteran, disadvantaged, HUB, women, disabled). Beyond the specific goals of this proposal, EHA makes every effort to provide opportunities for small businesses.

(9) EHA will include the clause at 52.219-8, Utilization of Small Business Concerns (see 19.708(a)), in all subcontracts that offer further subcontracting opportunities, and will require all subcontractors (except small business concerns) that receive subcontracts in excess of $650,000 ($1.5 million for construction) to adopt a plan that complies with the requirements of the clause at 52.219-9, Small Business Subcontracting Plan (see 19.708(b));

(10) EHA agrees to cooperate in any studies or surveys that may be required. EHA agrees to submit periodic reports (annually, or when requested by DTRA) so the government can determine the extent of compliance by EHA to the subcontracting plan.

- EHA will submit an Individual Subcontract Report (ISR) and a Summary Subcontract Report (SSR) using eSRS when required.
- EHA will submit a ISR semi-annually and within 30 days of contract completion. We will use the eSRS system and follow the instructions detailed on the eSRS system
- EHA will submit an SSR annuals for the twelve month period ending September 30th. We will use the eSRS system and follow the instructions detailed on the eSRS system.
- EHA does not currently have, or plan to have subcontractors with subcontracting plans. None of EHA's subcontractors have subcontractors of their own.

(11) EHA agrees that it will maintain at least the following types of records to document compliance with the subcontracting plan:

- Source list, guides, and other data identifying SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns.
- Organizations contacted to locate SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns.
- On a contract-by-contract basis, records on all subcontract solicitations over $100,000, indicating for each solicitation (1) whether SB concerns were solicited, and if not, why not; (2) whether HUBZone SB concerns were solicited, and if not, why not; (3) whether SDB concerns were solicited, and if not, why not; (4) whether WOSB concerns were solicited, and if not, why not, (5) whether veteran owned or service disabled veteran concerns were solicited and if not, why not; and (6) reasons for the failure of solicited SB, HUBZone SB, SDB, WOSB and veteran owned or service disabled veteran owned concerns to receive the subcontract award.

Based upon the above criteria, we have selected our small business contractor in accordance with our plan. We are committed to the small business goals as outlined in FAR 19.702 and will continue to administer our subcontracting program, inclusive of contractual agreements and monthly invoices and reports, in accordance with these regulations.

Cheers,

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist
EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001
1.212.380.4497 (direct)
1.612.743.1265 (mobile)

DATA RIGHTS ASSERTION LIST

Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software

The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted

Technical data or computer software to be furnished with restrictions*	Basis for assertion**	Asserted rights category***	Name of person asserting restrictions****
None	None	None	None

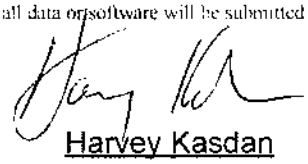
*For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such item, component, or process. For computer software or computer software documentation identify the software or documentation

**Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions

***Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses)

****Corporation, individual, or other person, as appropriate

*****Enter "none" when all data or software will be submitted without restrictions.

Signature:  Date: 09/12/14

Printed Name: Harvey Kasdan

Title: Chief Financial Officer

Company Name: EcoHealth Alliance

APL Use Only:
Forward to APL Prime Contract Representative, Program Manager and Office of Patent Counsel.

(b)(6) **CTR DTRA J4-8 (US)**

From: (b)(6) CTR DTRA J4-8 (US)
Sent: Thursday, November 10, 2016 12:57 PM
To: 'Karissa Whiting'; 'allen@ecohealthalliance.org'
Cc: (b)(6) CTR (US); DTRA Ft Belvoir J9 List J9CB CB Contract Awards; DTRA Ft Belvoir J4-8 Mailbox BFKF SPS Contracts; DTRA Ft Belvoir J4-8 Mailbox DTRA Contract Property; 'ONR_Boston@navy.mil'(b)(6) (b)(6) CTR (US)
Subject: HDTRA1-15-C-0041 Modification P00003 with EcoHealth Alliance
Attachments: HDTRA1-15-C-0041-P00003 Fully Executed.pdf

Hi Karissa,

Fully signed modification P00003 is attached for your files.

Let me know if you have any questions or need anything.

Thank you,

(b)(6)
Senior Contract Specialist (Contractor)
Contracts - Research & Development Division (J4CRC) Defense Threat Reduction Agency
Phone (b)(6)
Email:
Notice: This contractor support employee is acting in an advisory role only and has no authority to bind the government in any way.

From: (b)(6) CTR DTRA J4-8C (US)
To: "whiting@ecohealthalliance.org"; "huff@ecohealthalliance.org"
Cc: (b)(6)
Subject: HDTRA1-15-C-0024 Letter of Intent to Exercise Option with EcoHealth
Date: Tuesday, March 1, 2016 8:57:00 AM
Attachments: OPTION Letter of Intent HDTRA1-15-C-0041.pdf

Hello Karissa and Andrew,

Please see attached for the letter of intent to exercise the option on the subject effort.

Let me know if you have any questions.

Thank you,

(b)(6)
Senior Contract Specialist (Contractor)
Contracts - Research & Development Division (J4CRC)
Defense Threat Reduction Agency
Phone (b)(6)
Email

Defense Threat Reduction Agency
8725 John J. Kingman Road MSC 6201
Fort Belvoir, VA 22060-6201

March 1, 2016

EcoHealth Alliance, Inc.
ATTN: Harvey Kasdan
460 West 34th Street – 17th Floor
New York, NY 10001

Dear Mr. Kasdan:

This letter is in reference to Defense Threat Reduction Agency (DTRA) Contract Number HDTRA1-15-C-0041 which provides the "Global Rapid Identification Tool System (GRITS)".

You are advised, in accordance with Contract Clause 52.217-9, "Option to Extend the Term of the Contract," the Government intends to exercise Option Period I under Contract Line Item Numbers (CLINs) 1001 and 1002 for the period of April 9, 2016 through to April 8, 2017.

This notice of the Government's intent to exercise the aforementioned option shall not be construed as an authorization to begin new work in the option period, nor does it commit the Government to the exercise of the option. All terms and conditions of the contract remain in full force and effect.

If you require additional information, please contact (b)(6) Contract Specialist, at (b)(6) or the undersigned at (b)(6)

Sincerely,

(b)(6)

Contracting Officer

From: (b)(6) CTR DTRA J4-8C (US)
To: "whiting@ecohealthalliance.org"; "Dr. Andrew Huff"
Cc: (b)(6)

Subject: HDTRA1-15-C-0041 Mod P00002 Option 1 Exercise with EcoHealth
Date: Wednesday, March 16, 2016 9:55:00 AM
Attachments: HDTRA1-15-C-0041 Mod P00002 signed.pdf

Hello Karissa and Andrew,

Unilaterally executed Option Exercise Mod is attached for your records.

Please confirm receipt when you get a chance.

If you received this email in error, please reply immediately so the distribution can be corrected.

Thank you,

(b)(6)
Senior Contract Specialist (Contractor)
Contracts - Research & Development Division (J4CRC)
Defense Threat Reduction Agency
Phone (b)(6)
Email

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00002	08-Apr-2016	J9CBA19766	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DCMA GARDEN CITY 605 STEWART AVENUE GARDEN CITY NY 11530-4761	S3309A

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14. PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
IAW FAR 52.217-9 Option to Extend the Term of the Contract

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: duncank161055
J9CBA19766

The purpose of this modification is to exercise Option Period 1 consisting of CLINs 1001 and 1002, apply incremental funding to CLIN 1001 via new SLIN 100101, update clauses 252.232-9000 and 253-232-9001, and administratively update the "Ship To Address" on CLINs 0001 and 1001 in order to reflect current COR information and comply with Department of Defense (DoD) Procurement Data Standard (PDS).

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
		(b)(6) CONTRACT SPECIALIST TEL: (b)(6) EMAIL: (b)(6)
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA (b)(6) BY _____
_____ (Signature of person authorized to sign)		(Signature of Contracting Officer)
		16C. DATE SIGNED 16-Mar-2016

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $2,262,641.00 from $2,217,037.00 to $4,479,678.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 1001
The option status has changed from Option to Option Exercised.

CLIN 1002
The option status has changed from Option to Option Exercised.

SUBCLIN 100101 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
100101					$0.00
	Incremental Funding				
	COST				
	Incremental Funding for Option Peiod 1.				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AC				$1,696,980.75
	CIN: JBCBA19766000101				

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 100101:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC

POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY SEE SEPARATE LETTER 8725 JOHN J. KINGMAN RD., MSC 6201 FORT BELVOIR VA 22060 FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $1,696,980.75 from $2,217,037.00 to $3,914,017.75.

SUBCLIN 100101:

Funding on SUBCLIN 100101 is initiated as follows:

ACRN: AC

CIN: JBCBA19766000101

Acctng Data: 044315 097 0400 000 N 20162017 D 2620 0602384BP_CB_CBA_RC 1617_0400_2620_TM2DN DTRA 255

Increase: $1,696,980.75

Total: $1,696,980.75

The following have been modified:

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

CLIN 0001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,217,037.00 is obligated for work to be performed during the period beginning with contract award and continuing through April 8, 2016. CLIN 0001 is FULLY FUNDED.

CLIN 1001 Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $1,696,980.75 is obligated for work to be performed during the CLIN 1001 period of perforamce start date of April 9, 2016 and continuing through its end date. Incremental funding planned, but not obligated is: $565,660.25.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed $_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of $_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of $_____C_____. Within this amount ($_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

CLIN 0001

A: $2,217,037.00
B: $0
C: $2,217,037.00

CLIN 1001

A: $2,262,641.00
B: $0
C: $1,696,980.75

(End of Summary of Changes)

From: (b)(6) DTRA J4-8 (US)
To: Karissa Whiting
Cc: "Toph Allen"; (b)(6)
Belvoir J4-8 Mailbox BFKF SPS Contracts; DTRA Ft Belvoir J4-8 Mailbox DTRA Contract Property;
"ONR_Boston@navy.mil"; (b)(6)
Subject: HDTRA1-15-C-0041- P00004 EcoHealth, NCE
Date: Thursday, March 16, 2017 9:02:00 AM
Attachments: HDTRA1-15-C-0041-P00004 Fully Executed.pdf

Hi Karissa,

Attached, please find a copy of the fully executed subject modification for your files.

Let me know if you have any questions.

Thank you,

(b)(6)
Senior Contract Specialist (Contractor)
Contracts - Research & Development Division (J4CRC) Defense Threat Reduction Agency
Phone: (b)(6)
Email:

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00004	08-Apr-2017	J9CBA19766	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Bilateral Mod IAW FAR 43.103(a)(3) Mutual Agreement

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: duncank171066

J4CRJ9CBA172109

The purpose of this modification is to:

1. Extend Option Period 1, CLINs 1001 and 1002 through to September 30, 2017 at no additional cost to the Government. As consideration for this extension, the Contractor shall develop and provide to the Government, at the Contractor's expense, a diagnostic engine that will create a summary report of separate articles that are linked to a single disease event.
2. Update CLINs 0002 and 1002 to identify them as not separately priced with a quantity of 1, and add ship to addresses in order to comply with DoD Procurement Data Standard requirements.
3. Realign ACRN AB funding from SLIN 000101 to CLIN 0001 in order to correct an issue wherein funding was incorrectly assigned to both the CLIN and SubCLIN. This realignment does not affect the total funding amount allocated to, or available for vouchers against, CLIN 0001.
4. Remove FOB and inspection terms from funding SubCLINs.
5. Replace Section G DFAS payment instruction clause 252.204-9002 with 252.204-0002.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Peter Daszak	(b)(6) TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)	3/15/17	BY (b)(6) (Signature of Contracting Officer)	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000101
The unit of issue Lot has been deleted.
The FOB Destination has been deleted.

CLIN 0002
The CLIN type priced has been added.
The pricing detail quantity 1.00 has been added.
The cost constraint NSP has been added.

SUBCLIN 100101
The FOB Destination has been deleted.

SUBCLIN 100102
The FOB Destination has been deleted.

CLIN 1002
The CLIN type priced has been added.
The pricing detail quantity 1.00 has been added.
The cost constraint NSP has been added.

SECTION E - INSPECTION AND ACCEPTANCE

The Acceptance/Inspection Schedule for SUBCLIN 000101 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for CLIN 0002 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
Destination	Government	Destination	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY

N/A	N/A	N/A	Government

The Acceptance/Inspection Schedule for SUBCLIN 100101 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for SUBCLIN 100102 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule Item has been deleted from CLIN 0002:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2015 TO 08-APR-2016	N/A	N/A FOB: Destination	

The following Delivery Schedule item has been added to CLIN 0002:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2015 TO 08-APR-2016	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CB (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 09-APR-2016 TO 08-APR-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 30-SEP-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CBA (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 1002 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 08-APR-2017	N/A	N/A FOB: Destination	

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 09-APR-2016 TO 30-SEP-2017	N/A	DEFENSE THREAT REDUCTION AGENCY/J9CB (b)(6) 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

CLIN 0001:

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255 (CIN J9CBA142120001) was increased by $99,550.79 from $2,117,486.21 to $2,217,037.00

SUBCLIN 000101:

AB: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255 (CIN J9CBA166590000101) was decreased by $99,550.79 from $99,550.79 to $0.00

The following have been added by reference:

252.204-0002

The following have been deleted:

252.204-9002

(End of Summary of Changes)

From:	(b)(6)
To:	Harvey Kasdan (kasdan@ecohealthalliance.org)
Cc:	Amy Slagle (slagle@ecohealthalliance.org); Jon Epstein (epstein@ecohealthalliance.org); Carla Tilchin (tilchin@ecohealthalliance.org)
Subject:	HDTRA114-AMD1-CBA-03-2-0022 "Global Rapid Identification Tool Set (GRITS)"
Date:	Monday, August 18, 2014 8:35:00 AM
Attachments:	Fact Finding Letter EcoAlliance signed.pdf COST BREAKOUT TEMPLATE.xlsx DFARS FY14 Provision Clause tailored.pdf CB10094_EHA_CDRLs_DRAFT.doc

Dear Mr. Kasdan,

Congratulations! The Defense Threat Reduction Agency (DTRA) is providing notification that your proposal titled " Global Rapid Identification Tool Set (GRITS)" submitted under Broad Agency Announcement HDTRA114-AMD1-CBA-03-2-0022 has been tentatively selected for contract award. Please see the attached Fact Finding Letter for a request for additional information. All responses to this request are due at your earliest convenience, but DTRA would prefer no later than COB August 25, 2014. Please submit your response to me at (b)(6)

Thank you in advance for your time and assistance with this matter. Please let me know if you have any questions.

Best,

(b)(6)

Contract Specialist, J4CRC Contracts

(b)(6)

DTRA/J4CRC
8725 John J. Kingman Road
MSC 6201 (#2725D)
Fort Belvoir, VA 22060-6201

Defense Threat Reduction Agency
8725 John J. Kingman Road, MSC 6201
Ft Belvoir, VA 22060-6201

August 18, 2014

EcoHealth Alliance Inc.
Mr. Harvey Kasdan
460 West 34th Street, 17th Floor
New York, New York 10001-2320

Dear Mr. Kasdan:

Congratulations! The Defense Threat Reduction Agency (DTRA) is providing notification that your proposal titled "Global Rapid Identification Tool Set (GRITS)" submitted under Broad Agency Announcement (HDTRA114-AMD1-CBA-03-2-0022) has been tentatively selected for contract award.

In order to proceed, DTRA requests that you provide additional information to your proposal in the following areas:

- Contract type. The Government plans to award a cost contract for this research and development effort. Grants are not a consideration for this selection.

- Technical Comments
  - Please remove Tasks 7 and 8; they do not align with current DTRA BSVE objectives.
  - Please remove Task 22; this is a duplicate task currently funded under BSVE efforts.
  - Please provide an updated cost estimate spreadsheet reflecting the removal of Tasks 7, 8 and 22 using the cost breakdown spreadsheet provided, and active cells containing formulae.
  - Please provide an updated PI name and hourly rate information that reflects the new PI for this project, as well as any other new project personnel that replace former project personnel.
  - Please clarify and verify the duration and access terms of the GRID and EcoHD datasets once integrated with BSVE.

- Cost Proposal
  The responsibility for providing adequate supporting data and attachments lies solely with the Offeror. Further, the Offeror must also bear the burden of proof in establishing reasonableness of proposed costs; therefore, it is in the Offeror's best interest to submit a fully supportable and well-prepared cost proposal. The basis and rationale for all proposed costs should be provided as part of the proposal so that Government personnel can place reliance on the information as current, complete, and accurate.
  All proposals are subject to the requirements of the Truth in Negotiations Act (TINA). Any proposal exceeding the threshold listed in FAR 15.403-4(a)(1) must submit a certificate of current cost and pricing data in the format described in FAR 15.406-2. The certificate of current cost and pricing data is required with proposal submission, however, after negotiations Offerors may be asked to re-submit an updated certificate.

Note: ***Your proposal is currently over the TINA threshold of $700,000.***

A. **Cost Breakdown:** The Offeror shall prepare and submit the Cost Proposal (with the exception of the narrative information described below) using Microsoft Excel format, with active formulae.

Offeror format acceptable provided it includes a detailed cost breakdown of all costs by cost element in accordance with Tables 1 - 5: Sample Formats attached. The Offeror must also provide a narrative to support the requirements in each cost element. In addition, the Offeror must provide a separate cost proposal, in the same level of detail as the prime contractor for each subcontractor or consultant which were not selected on adequate price competition.

Cost elements should include the following:

a. LABOR: Individual labor categories or persons (principal investigator, graduate students, etc.), with associated labor hours and unburdened labor rates.
   i. Please provide payroll record documentation to support the proposed labor rates.

b. MATERIALS: Cost of materials, broken out to the level of detail shown in Table 2. Clearly delineate any computer or IT purchases.

c. EQUIPMENT: Cost of equipment, broken out to the level of detail shown in Table 3.

d. TRAVEL: Cost of each trip, broken out to the level of detail shown in Table 4.

e. OTHER DIRECT COSTS (ODC): Cost of ODCs, broken out to the level of detail shown in Table 5. Examples of ODCs include but are not limited to the following:
   i. Publication and report cost
   ii. Laboratory and Computer Usage Fees
   iii. Communication costs not included in overhead
   iv. Consultant Services.

f. SUBCONTRACTOR: Total cost for each subcontractor and/or consultant (**to include each proposed CRO**), broken out to the level of detail shown in Table 6. Any subcontractor not selected on the basis of adequate price competition must provide a separate cost break out that is in compliance with the requirements included in this Attachment.

Specific questions:

- Epidemico
  - Please provide a cost breakdown spreadsheet with active formulae in the cells per the template supplied by DTRA.
  - Please provide payroll record documentation to support the proposed labor rates.
  - Please provide a breakdown of fringe.
  - Please provide a breakdown of the ODCs—specify the consultant, purpose and rate.
  - Please provide the vendors and catalog item numbers for the proposed materials and supplies.
  - Please share a copy of the most recent DHHS rate agreement.

- Kitware
  - Please provide a cost breakdown spreadsheet with active formulae in the cells per the template supplied by DTRA.
  - Please provide payroll record documentation to support the proposed labor rates.
  - Please provide a breakdown of fringe.
  - Please provide a breakdown of the ODCs --specify the consultant, purpose and rate.
  - Please provide the vendors and catalog item numbers for the proposed materials and supplies.
  - Please share a copy of the most recent rate agreement or recommendation.

- ISID—ProMED Mail
  - Please provide a cost breakdown spreadsheet with active formulae in the cells per the template supplied by DTRA.
  - Please provide payroll record documentation to support the proposed labor rates.
  - Please provide a breakdown of fringe.
  - Please provide a breakdown of the ODCs—specify the consultant, purpose and rate.
  - Please provide the vendors and catalog item numbers for the proposed materials and supplies.
  - Please share a copy of the most recent DHHS rate agreement.

g. INDIRECT COSTS:
   i. Fringe Benefits
      - Please provide a copy of the most recent memorandum from DHHS outlining your rate agreement.
   ii. Overhead
   iii. Material Handling
   iv. General and Administrative

B. **Cost Narrative**: All Offerors are required to provide a narrative to support each cost element proposed.

a. LABOR: Offerors must provide a basis of estimate for the number of hours or months proposed as well as the labor categories chosen for the work to be performed. Provide any rate agreements justifying the labor rates proposed.

b. MATERIALS: Offerors must provide a basis of the materials proposed and why these materials are necessary for the work to be performed. Include quotations when available. Also provide the rationale that demonstrates how the Offeror determined the costs fair and reasonable.

Specific questions:

- You have supplied a copy of EcoHealth Alliances' purchasing policy for ensuring best value in the initial proposal package.
- Please provide the suppliers to be used for material purchases, as well as corresponding catalog/part numbers for materials.
- Please provide a breakdown of the materials/supplies to be purchased on the supplied Cost Template spreadsheet.

c. TRAVEL: Offerors must provide justification for each trip proposed. Include what will be accomplished and explain how each trip benefits DTRA. Trips proposed that benefit the Offeror and/or more than one Government agency under another contract may be subject to cost sharing.

NOTE: Travel cost estimates should be based on the following:

Except as provided in FAR 31.205-46(a)(3), costs incurred for lodging, meals, and incidental expenses shall be considered to be reasonable and allowable only to the extent that they do not exceed on a daily basis the maximum per diem rates in effect at the time of travel as set forth in the:

(i) Federal Travel Regulations, prescribed by the General Services Administration, for travel in the contiguous United States,

(ii) Joint Travel Regulation, Volume 2, DoD Civilian Personnel, Appendix A, prescribed by the Department of Defense, for travel in Alaska, Hawaii, and outlying areas of the United States, or the

(iii) Standardized Regulations (Government Civilians, Foreign Areas), Section 925, "Maximum Travel Per Diem Allowances for Foreign Areas," prescribed by the Department of State, for travel in areas not covered in (a)(2)(i) and (ii) of FAR 31.205-46.

NOTE: **DTRA policy does not allow fee to be applied to travel.**

d. OTHER DIRECT COSTS (ODC): Offerors must provide a basis of the ODCs proposed and why they are necessary for the work to be performed. Provide quotations or publically posted price lists to support the costs proposed. Also provide the rationale that demonstrates how the Offeror determined the costs fair and reasonable.

Please provide a copy of your most recent OMB Circular A-133 Audit Report.

e. INDIRECT COSTS: Offerors must submit a copy of any current Forward Pricing Rate Agreements or Forward Pricing Rate Recommendations with Government agencies, such as DCMA or Department of Health and Human Services. If no agreement has been made with a Government representative, Offerors must provide all rates, factors, and bases by year utilized in the development of the proposal and the basis of those rates and factors.

f. FEE: If fee is proposed, offerors must provide rationale supporting the fee proposed.

NOTE: Offerors are encouraged to review the factors for how the Government evaluates contractor proposed fee located in DFARS 215.404-71.

- Statement of Work (SOW). Please ensure the following:
  A. Use "the contractor shall" whenever the work statement expresses a provision that is binding. Use "should" or "may" whenever it is necessary to express a declaration of purpose. Use "will" in cases where no Offeror requirement is involved; e.g., power will be supplied by the Government. Use active voice in describing work to be performed.

  B. The work effort should be segregated by performance period for all tasks to be performed in that year (e.g. Base Period, Option Period 1, Option Period 2, etc.). Identify the major tasks in separately numbered sub-paragraphs. Each major task should delineate, by subtask, the work to be performed by period. Number each task using the following decimal system (e.g. 4.1, 4.1.1, 4.1.1.1, 4.2, etc.).

  C. Identify in section 4, which group is performing each task/subtask (i.e. Prime or Sub).

  D. Clearly identify in the text of section 4 which period (e.g. Base Period, Option Period 1, etc.) the task will be performed in.

  E. Provide the SOW as a Microsoft Word document so it can be formatted as an attachment to the contract. Please ensure that the title and date of the SOW appear on the document.

- Human Use.
  The proposal notes that the proposed effort ***does not*** include human subjects or materials research. Please confirm that this remains true. If human subjects or materials research is

to be included in the effort, the work must be reviewed and approved by the DTRA Human Research Oversight Board.

- Animal Use.
  The proposal notes that the proposed effort ***does not*** include research involving animals on this effort. Please confirm that this remains true. If animal subjects are to be included in the effort, you must obtain IACUC/ACURO approval before animal studies may begin.

- CDRLs/Other Deliverables.
  See attached CDRLs/Other Deliverables DD 1423, which identifies each deliverable required by DTRA for this contract. Should you take any exception to the requirements stated therein, please notify DTRA in your response to this fact finding letter.

- System for Award Management (SAM). ***Verify and Update your SAM record by certifying to the required DFARs clauses.***

  A. After reviewing the SAM information, please verify that the representations and certifications currently posted electronically have been entered or updated within the last 12 months, inclusive of the following:

     - FAR 52.209-7 Information Regarding Responsibility Matters:
     - FAR 52.225-20 Prohibition on Conducting Restricted Business Operations in Sudan--Certification;
     - DFARS Provisions 252.209-7001, Disclosure of Ownership or Control by the Government of a Terrorist Country;
     - DFARS 252.247-7022 Representation of Extent of Transportation by Sea; and
     - DFARS 252.225.7031 Secondary Area Boycott of Israel:
     - DFARS 252.203-7000 Requirements Relating to Compensation of Former DoD Officials.

  B. The following clauses are not currently in SAM. Please review the addendum attachment containing these clauses, certify and sign them, and return them:

     - DFARS 252.203-7005 Representation Relating to Compensation of Former DoD Officials.

     NOTE: If any of the above mentioned provisions are not contained in the SAM database, EcoHealth Alliance is required to acknowledge and submit in writing documentation that they have read and understand each provision.

- Intellectual Property:

A. Data Rights. Please provide a data rights assertions list.

Identify on a Data Rights Assertions List all technical data and computer software, to the extent known at this time, that the Offeror, its subcontractors or suppliers, and potential subcontractors or suppliers, will furnish to the Government with less than "unlimited rights" to use, release and disclosure in accordance with DFARS 252.227-7017, Identification and Assertion of Use, Release or Disclosure Restrictions, and DFARS 252.227-7028, Technical Data or Computer Software Previously Delivered to the Government. Every Offeror proposing to deliver technical data or computer software to the Government will provide a Data Rights Assertions List as an attachment to their offer. The Data Rights Assertion List will contain a table of data deliverables to be furnished to the Government with rights restrictions, as illustrated in DFARS 252.227-7017 (d). This attachment will additionally provide the statement given in DFARS 252.227-7017 (d), signed and dated by an official authorized to contractually obligate the Offeror. If the Offeror will deliver all technical data and computer software to the Government without restrictions, enter "NONE" in this table under the heading "Technical Data or Computer Software to be Furnished with Restrictions."

Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions to Government's rights. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. For computer software, development refers to the software. The Government's rights in computer software documentation generally may not be restricted. In addition, if development was not accomplished at private expense, or for computer software documentation, there are also several specific bases for asserting restrictions.

When listing technical data (other than computer software documentation) pertaining to items, components, or processes, identify both the data deliverable from the CDRL and each such item, component, or process as specifically as possible (e.g., by referencing the CDRL and the specific sections of the proposal, data item numbers or item numbers, or specific technology or components). When listing computer software or computer software documentation, identify the software or documentation by specific name or module or item number.

For each of the technical data or computer software identified in the Data Rights Assertion List, identify the following information:

(i) Identify the basis for the assertion. Generally "developed exclusively at private expense" or "developed partially at private expense" are the only basis to assert restrictions in Government rights. In general, the Government rights in computer software documentation cannot be restricted. If development was not accomplished at private expense, or for computer software documentation, describe the specific basis for asserting restrictions. For example, basis for restricting Government rights may be:

(A) Development at private expense, either exclusively or partially. Indicate whether development was accomplished exclusively or partially at private expense.

(B) Rights under a prior government contract, including SBIR data rights for which the protection period has not expired.

(C) Standard commercial license customarily provided to the public.

(D) Specifically negotiated license rights.

(ii) Identify the asserted rights category for the technical data or computer software from the applicable clauses:

(A) For non-commercial technical data (other than computer software documentation), use the clause found at DFARS 252.227-7013, (e.g., government purpose rights; limited rights; specifically negotiated license rights; or rights under prior Government contracts, including SBIR data rights for which the protection period has not expired);

(B) For non-commercial computer software and non-commercial computer software documentation, use the clause at DFARS 252.227-7014 (e.g. government purpose rights, restricted rights, and specifically negotiated license rights, and rights under prior Government contracts, including SBIR data rights for which the protection period has not expired);

(C) For commercial technical data (other than computer software documentation), use the clause found at DFARS 252.227-7015 (e.g. government use rights, or specifically negotiated license rights). (NOTE: This clause applies only if the item, component or process to which the technical data pertains meets the definition of "commercial item" in FAR 2.101)

(D) For commercial computer software and commercial computer software documentation, refer to DFARS 227 7202-3 (e.g. standard commercial license rights, or specifically negotiated license rights). See definition of "commercial computer software" under DFARS 252.227-7014.

(iii) Offeror shall attach to its offer for each listed item copies of all proposed specifically negotiated license(s), Offeror's standard commercial license(s), and any other asserted restrictions other than government purpose rights, limited rights, government use rights, rights under prior government contracts, including SBIR data rights for which the protection period has not expired.

Both noncommercial and commercial data/software restrictions should be identified in the Data Rights Assertions list. Should the Offeror propose a specifically negotiated license or a commercial license, then the Offeror must include ALL the terms and conditions of that license. If an Offeror makes no assertions in accordance with the DFARS 252.227-7017, the Government will assume that the Offeror will deliver all data with "unlimited rights."

If the Offeror is awarded a contract, the Data Rights Assertions list shall be listed in an attachment to that contract. Upon request by the Contracting Officer, the Offeror shall provide sufficient information to enable the Contracting Officer to evaluate any listed assertion.

- **In accordance with FAR clause 52.222-37(c), Employment Reports on Veterans, EcoHealth Alliance is required to complete the Form VETS-100A, entitled "Federal Contractor Veterans' Employment Report (VETS-100A Report)." Please provide confirmation of your registration.**

- **Please provide a copy of EcoHealth Alliance's Subcontracting Plan.**

- Request EcoHealth Alliance extend the proposal validity through 150 days from the date of this letter.

- **Please provide a copy of the most recent OMB Circular A-133 Audit Report.**

- In accordance with Office of the Secretary of Defense (OSD) Memo dated November 29, 2012, "Enterprise-wide Contractor Manpower Reporting Application" (p. 3), DTRA will include an H Clause: "The contractor shall report ALL contractor labor hours (including subcontractor labor hours) required for performance of services provided under this contract for the [NAMED COMPONENT] via a secure data collection site. The contractor is required to completely fill in all required data fields using the following web address: http://www.ecmra.mil/ Reporting inputs will be for the labor executed during the period of performance during each Government fiscal year (FY), which runs October 1 through September 30. While inputs may be reported any time during the FY, all data shall be reported no later than October 31 of each calendar year, beginning with 2013. Contractors may direct questions to the help desk at help desk at: http://www.ecmra.mil."

- This is a reminder that any and all press releases must be approved by the contracting officer. It is advised not to release any information concerning this effort until a contract is signed and awarded.

Based on your response to these items, and further technical and cost analysis, we may require more information or revisions at a later date. Please note this is not an opportunity to revise other portions of your proposal. Negotiations will begin after receipt and review of information provided in response to this letter.

It is DTRA's intent to negotiate and award the contract so that there is continuity between the new effort and the Period of Performance expiration of the current contract HDTRA1-13-C-0029. In order to expedite the negotiation and award process, we request you send all information listed above as soon as it is available. All responses to this request are due by COB August 25, 2014 and should be submitted to Marie Sepe at marie.sepe@dtra.mil. The subject line of the e-mail should include your organization's name.

Should you have any questions, don't hesitate to contact me.

Sincerely,

(b)(6)

Contract Specialist

Attachments:

1. Cost Breakout Template
2. Contract Data Requirements List, DD Form 1423 – 11 Pages
3. DFARS FY14 Provision Clauses

COST SUMMARY

	Base Period			Option I			Option II			Option III			Option IV		
Cost Element	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount
Labor Category & Title	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
Example: "Material Scientist"	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
	$	XX	$	$	XX	$	$	XX	$	$	XX	$	$	XX	$
TOTAL DIRECT LABOR		XX	$		XX	$		XX	$		XX	$		XX	$
LABOR BURDEN	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount
FRINGE BENEFITS	"c	$	$	"n	$	$	"n	$	$	°n	$	$	°n	$	$
OVERHEAD	"c	$	$	"n	$	$	"n	$	$	°n	$	$	°n	$	$
TOTAL LABOR BURDEN			$			$			$			$			$
TOTAL MATL EQUIPMENT			$			$			$			$			$
TOTAL TRAVEL COSTS			$			$			$			$			$
TOTAL ALL OTHER DIRECT COSTS			$			$			$			$			$
TOTAL SUBCONTRACTOR COSTS			$			$			$			$			$
TOTAL DIRECT COSTS			$			$			$			$			$
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A OR F&A	"a	$	$	"n	$	$	"n	$	$	"n	$	$	"n	$	$
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$			$			$			$			$
TOTAL COSTS			$			$			$			$			$
FEE PROFIT	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount
FEE OR PROFIT	"a	$	$	"n	$	$	"n	$	$	"n	$	$	"n	$	$
TOTAL COST PLUS FEE			$			$			$			$			$

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information
Example: Fiberscope	Company A	1000001	$10,000	2	$20,000	Base Period	List how item pricing was estimated (competitive quotes, established price lists, etc). If competitive quotes were obtained, provide a copy of those quotes. Provide website link listing item and price if pricing was established based on website pricing.
Example: Consumables	N/A	N/A	N/A	N/A	$15,000	Option 1	

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:			**Location:**			**Contract Period**
Purpose:						(Select Period)
Days	**# of People**	**Airfare**	**Per Diem**	**Lodging**	**Other**	**Total**
						$0.00

Itemized Expenses for "Other"

Description		**Amount**
	Total:	$0.00

Trip #:			**Location:**			**Contract Period**
Purpose:						(Select Period)
Days	**# of People**	**Airfare**	**Per Diem**	**Lodging**	**Other**	**Total**
						$0.00

Itemized Expenses for "Other"

Description		**Amount**
	Total:	$0.00

Trip #:			**Location:**			**Contract Period**
Purpose:						(Select Period)
Days	**# of People**	**Airfare**	**Per Diem**	**Lodging**	**Other**	**Total**
						$0.00

Itemized Expenses for "Other"

Description		**Amount**
	Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
Example: Laboratory Usage	$20,000	Base Period	List detailed description and additional information stating the need for the requirement and the method with which the total cost was calculated. Example: Twenty hours of laboratory usage is required to complete Task 4 and was calculated at a rate of $200 per hour. Laboratory hours were estimated based on experience with previous efforts of a similar size and scope.

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information
Company A	$100,000	Base Period	Provide a description of the role of the subcontractor for the effort and how subcontractor pricing was obtained. If competitive procedures were utilized, provide evidence of that competition for comparison.
Company B	$200,000	Base Period	
Company A	$50,000	Option I	

252.203-7005 Representation Relating to Compensation of Former DoD Officials.

REPRESENTATION RELATING TO COMPENSATION OF FORMER DOD OFFICIALS (NOV 2011)

(a) *Definition.* "Covered DoD official" is defined in the clause at 252.203-7000, Requirements Relating to Compensation of Former DoD Officials.

(b) By submission of this offer, the offeror represents, to the best of its knowledge and belief, that all covered DoD officials employed by or otherwise receiving compensation from the offeror, and who are expected to undertake activities on behalf of the offeror for any resulting contract, are presently in compliance with all post-employment restrictions covered by 18 U.S.C. 207, 41 U.S.C. 2101-2107, and 5 CFR parts 2637 and 2641, including Federal Acquisition Regulation 3.104-2.

(End of provision)

52.209-7 – Information Regarding Responsibility Matters.

As prescribed in 9.104-7(b), insert the following provision:

Information Regarding Responsibility Matters (Feb 2012)

(a) *Definitions.* As used in this provision—

"Administrative proceeding" means a non-judicial process that is adjudicatory in nature in order to make a determination of fault or liability (*e.g.*, Securities and Exchange Commission Administrative Proceedings, Civilian Board of Contract Appeals Proceedings, and Armed Services Board of Contract Appeals Proceedings). This includes administrative proceeding at the Federal and State level but only in connection with performance of a Federal contract or grant. It does not include agency actions such as contract audits, site visits, corrective plans, or inspection of deliverables.

"Federal contracts and grants with total value greater than $10,000,000" means

(1) The total value of all current, active contracts and grants, including all priced options; and

(2) The total value of all current, active orders including all priced options under indefinite-delivery, indefinite-quantity, 8(a), or requirements contracts (including task and delivery and multiple-award Schedules).

"Principal" means an officer, director, owner, partner, or a person having primary management or supervisory responsibilities within a business entity (*e.g.*, general manager; plant manager; head of a division or business segment; and similar positions).

(b) The offeror [_] has [_] does not have current active Federal contracts and grants with total value greater than $10,000,000.

(c) If the offeror checked "has" in paragraph (b) of this provision, the offeror represents, by submission of this offer, that the information it has entered in the Federal Awardee Performance and Integrity Information System (FAPIIS) is current, accurate, and complete as of the date of submission of this offer with regard to the following information:

(1) Whether the offeror, and/or any of its principals, has or has not, within the last five years, in connection with the award to or performance by the offeror of a Federal contract or grant, been the subject of a proceeding, at the Federal or State level that resulted in any of the following dispositions:

(i) In a criminal proceeding, a conviction.

(ii) In a civil proceeding, a finding of fault and liability that results in the payment of a monetary fine, penalty, reimbursement, restitution, or damages of $5,000 or more.

(iii) In an administrative proceeding, a finding of fault and liability that results in—

(A) The payment of a monetary fine or penalty of $5,000 or more; or

(B) The payment of a reimbursement, restitution, or damages in excess of $100,000.

(iv) In a criminal, civil, or administrative proceeding, a disposition of the matter by consent or compromise with an acknowledgment of fault by the Contractor if the proceeding could have led to any of the outcomes specified in paragraphs (c)(1)(i), (c)(1)(ii), or (c)(1)(iii) of this provision.

(2) If the offeror has been involved in the last five years in any of the occurrences listed in (c)(1) of this provision, whether the offeror has provided the requested information with regard to each occurrence.

(d) The offeror shall post the information in paragraphs (c)(1)(i) through (c)(1)(iv) of this provision in FAPIIS as required through maintaining an active registration in the Central Contractor Registration database via https://www.acquisition.gov (see 52.204-7).

(End of provision)

Received and reviewed by:

Signature	Printed Name and Title	Date

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO	B. EXHIBIT	C. CATEGORY: TDP ____ TM ____ OTHER Management
	A	

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A001	Project Spend Plan		

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE	18. ESTIMATED TOTAL PRICE
DI-MGMT-81468	N/A	DTRA-J9CBA	

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	N/A	See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

16. REMARKS

1. Submission shall be furnished electronically via e-mail in contractor format
2. See attached addressee sheet for a listing of e-mail and postal addresses for the individuals listed in Block 14.
3. First submission within 30 days of contract award. Updates to be made annually.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO	B. EXHIBIT	C CATEGORY: TDP	TM	OTHER
	C			Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A002	Meeting/Teleconference Minutes		

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE	18. ESTIMATED TOTAL PRICE
DI-ADMN-81505	N/A	DTRA-J9CBA	

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		N/A	N/A

16. REMARKS

BLOCK 10: frequency depends on number of meetings and Teleconfernces

BLOCK 12: The contractor shall provide meeting minutes within 7 days after all meetings/teleconferences.

Microsoft Word is acceptable.

The minutes shall be provided via email in Microsoft Office compatible format to the Contracting Officer's Representative (COR).

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	2	0

G PREPARED BY	H. DATE	I APPROVED BY	J DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO	B. EXHIBIT	C CATEGORY: TDP ____ TM ____ OTHER Management
N/A	E	

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A003	Monthly Progress Report		
			18 ESTIMATED TOTAL PRICE

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80555A	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		Monthly	5 calendar days after month's end
8. APP CODE		**11 AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		Contract Award	5 calendar days after end of each month

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	2	0

16.REMARKS

The Monthly Progress Report shall highlight the technical progress made during the previous month, as well as provide quantitative estimates of cost, performance, and schedule, by month, for the quarter.

BLOCK 4: Paragraphs, subparagraphs, and line items described in DI-MGMT-80555A may be omitted or edited for appropriateness with prior approval from the Contracting Office. Please provide final recommended content and format to the contracting office with the response to the fact finding letter.

The Monthly Progress Reports will be used to update to the Project Plan (CDRL A002)

Contractor format will be used.

Monthly Progress Reports shall be provided via email in Microsoft Office compatible format to the Contracting Officer's Representative (COR).

Contractor format is acceptable.

G PREPARED BY	H. DATE	I APPROVED BY	J DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
	F	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE	17. PRICE GROUP
A004	Monthly Cost Status Report	Monthly Financial Status Report	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE	18. ESTIMATED TOTAL PRICE
DI-FNCL-80331A	NA	DTRA-J9CBA	

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT	NA	Monthly	5 calendar days after month's end
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		Contract Award	5 calendar days after month's end

16. REMARKS

1. Submission shall be furnished electronically via e-mail in contractor format
2. See attached addressee sheet for a listing of e-mail and postal addresses for the individuals listed in Block 14.
3. Minimum elements to be addressed:
a) total funding to date b) Cumulative expenditures to date for 1) Labor 2) Materials and Equipment 3) Travel 4) Other Direct costs 5) Indirect costs 6) Total

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	2	0

G PREPARED BY	H. DATE	I APPROVED BY	J DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
N/A	I	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A005	Final Report	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80555A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		One time	See Block 16

8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A	See Block 16	N/A

16. REMARKS

BLOCK 10: The final report takes the place of the annual report for the final Option Period.

BLOCK 12: End of Period of Performance (PoP), per the below schedule.

- The Contractor shall submit a Draft Final Report by the 60th calendar day prior to the end of the contract PoP.
- DTRA shall provide comments to the Contractor by the 30th calendar day following receipt of the Contractor's Draft Final Report.
- The Contractor shall submit the Final Report on the 30th Calendar day after receipt of DTRA's comments to the draft.

The final report will be delivered to DTIC as well as DTRA.

BLOCK 4: Paragraphs, subparagraphs, and line items described in DI-MGMT-80555A may be omitted or edited for appropriateness with prior approval from the Contracting Office. Please provide final recommended content and format to the contracting office with the response to the fact finding letter.

A Final Report shall be prepared at the end of the effort. A final report will be provided whether any or all of the contract options are exercised. This report takes the place of the last monthly report due. (A Financial report is still required.) The report shall be in contractor format and narrate a complete summary of the contract execution and associated results obtained. The narration will include outstanding problems and their potential solution, and problems solved during the course of the year, along with the solution to the solved problems. The report shall demonstrate how the Technology Readiness Level (TRL) has been advanced. The report shall be in a form compatible with DTIC requirements for publication.

Do not include performers and providers data in the publishable report.

14. DISTRIBUTION

a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
DTRA-DTRIAC	0	1	0
15. TOTAL	0	3	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
N/A	K	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A006	Master Government Property—Physical Inventory	GFP, GFE, GFM, and Contractor Acquired Property

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MGMT-80269	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16

8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A	See Block 16	See Block 16

16. REMARKS

16. REMARKS

BLOCK 10: Annually

BLOCK 11: Award of Contract/Task Order

BLOCK 12: 15 working days after the end of the first quarter of performance

BLOCK 13: Annually

During the performance of the Contract, the Contractor may purchase material or equipment using government funds (Contractor Acquired Property [CAP]) if approved by the Procurement Contracting Officer (PCO). The Contractor shall perform, record, and disclose physical inventory results of all CAP in the Contractor's possession via the attached Government Furnished Property forms. These forms will be supplied to the contractor electronically by the PCO, via the Contract Specialist, as described below:

1) Scheduled Government Furnished Property Form: The PCO will supply this form electronically to the Contractor prior to contract award. For any equipment the Contractor proposes to purchase, the Contractor shall fill out the CDRL A006 Link A (Scheduled Government Furnished Property Form) prior to contract award. The contractor shall return it to the PCO electronically. The form will become an attachment to the award.

2) Requisitioned Government Furnished Property Form: The PCO will supply this form electronically to the Contractor after contract award. As the equipment listed on the Scheduled Government Furnished Property Form is purchased, the Contractor shall fill out the CDRL A006 Link B (Requisitioned Government Furnished Property Form), and shall return it to the PCO electronically.

Links

A. CDRL A006 Link A, Scheduled Government Furnished Property Form, http://www.acq.osd.mil/dpap/pdi/pc/docs/ScheduledGovernmentFurnishedPropertyFORM.pdf

B. CDRL A006 Link B, Requisitioned Government Furnished Property Form http://www.acq.osd.mil/dpap/pdi/pc/docs/RequisitionedGovernmentFurnishedPropertyFORM.pdf

14. DISTRIBUTION	b. COPIES		
a. ADDRESSEE	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA/J4LP	0	1	0
DTRA/J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

Reset Form

Scheduled Government Furnished Property

Save

Attachment Number: CDRL A06 Atch A

Contract Number

DoD Enterprise Identifier: HDTRA1 - Year: 13 - Procurement Instrument Type Code: - Serialized Identifier: TBD - Order Number:

OR

Non-DoD Number:

Serialized Items List

Add	Copy	Item#	Descr	CAGE	Marking Instr	Model #	NSN	Nomen	Part #	Part or Indent #	Qty	Serial #	Type Designator	Unique Item #	Unit Acq Cost	Unit of Measure	Use As Is
X	#																

Non-Serialized Items List

Add	Copy	Item#	Descr	CAGE	Marking Instr	Model #	NSN	Nomen	Part #	Part or Ident #	Qty	Type Designator	Unit Acq Cost	Unit of Measure	Use As Is
X	#														

Guidelines for submitting this form

You need to have Adobe Reader or Adobe Acrobat 7.0.5 (or later) installed on your computer to submit this form. If required, download the latest version of Adobe Reader from this URL.

Some additional points to keep in mind:

- You will be able to submit the form only after you've filled in all the mandatory fields.
- Some fields in this form display a tool-tip when you hover your mouse pointer over them. Hover over the Enterprise Identifier field to see an example. For fields within the table, hover over the first row fields for tool-tips.

Requisitioned Government Furnished Property

Save

Attachment Number: CDRL A007 Atch B

Contract Number

DoD Enterprise Identifier	Year	Procurement Instrument Type Code	Serialized Identifier	Order Number
HDTRA1	13	C	TBD	

OR

Non-DoD Number

Non-Reimbursable List

Add	Item#	Descr	CAGE	Marking Instr	NSN	Nomen	Part or Indent #	Qty	Type Designator	Unit Acq Cost	Unit of Measure	Use As Is
X												
X												
X												
X												

Reimbursable List

Add	Item#	Descr	$ Limit Authorized	Marking Instr	NSN	Nomen	Part or Ident #	Qty	Unit of Measure	Use As Is
X										
X										
X										
X										

Guidelines for submitting this form

You need to have Adobe Reader or Adobe Acrobat 7.0.5 (or later) installed on your computer to submit this form. If required, download the latest version of Adobe Reader from this URL

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
N/A	L	TDP _____ TM _____ OTHER Management

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A007	Patents - Reporting of Subject Inventions	N/A

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
	N/A	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
		See Block 16	See Block 16

16. REMARKS

16. REMARKS

Invention Disclosures/Patents Subject Inventions Disclosures and Reports in accordance with either DFARS 252.227-7039 (Patents Reporting of Subject Inventions)/FAR 52.227-11 (Patent Rights – Ownership by the Contractor) or DFARS 252.227-7038 (Patent Rights – Ownership by the Contractor) (Large Business) : (1) Provide copies of invention disclosures for subject inventions within 2 months of an employee inventor reporting a subject invention to the Contractor (or, for large businesses, within 6 months after the Contractor first becomes aware that a subject invention has been made, whichever is earlier); (2) submit DD Form 882 every 12 months from the date of the contract award, even if no inventions are made during that period; (3) submit DD Form 882 in a final report, even if no inventions are made during the contract term; (4) submit a written statement of Contractor's election whether or not to retain ownership in a subject invention within 2 years of providing the invention disclosure, or, if any publication, on sale or public use of the subject invention has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, not later than 60 days prior to the end of the statutory period; (5) provide a copy of either a filed provisional or a filed nonprovisional patent application on an elected subject invention within 1 year after the election of title of the subject invention, or within the 1-year statutory period if it has been initiated, with an acknowledgement of government rights in the specification as identified at 37 C.F.R. § 401.14(f)(4), (6) provide a copy of a filed nonprovisional patent application on an elected subject invention within 10 months after filing the provisional patent application on the elected subject invention; and (7) provide for every subject invention upon which a patent application has been filed or a patent issued, a nonexclusive, nontransferable, irrevocable, paid-up license to the Government to practice, or have practiced for or on its behalf, the subject invention throughout the world, and an irrevocable power to inspect and make copies of the patent application file.

14. DISTRIBUTION			
a. ADDRESSEE	b. COPIES		
	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	2	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) &T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY:
N/A	K	TDP _____ TM _____ OTHER Software

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A008	Computer Software Product	

4. AUTHORITY *(Data Acquisition Document No.)*	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16

8. APP CODE	11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION
A	See Block 16	See Block 16

16. REMARKS

Unless otherwise specified, all deliverables listed are due at the end of the contract.

The contractor will deliver software that can interface with the Biosurveillance Ecosystem (BSVE). The software deliverables will be the following:

Within 12 months of contract award:
- Connect GRITS Girder database to the BSVE
- Develop recommendation and decision support capabilities
- Connect GRITS diagnostic and text-mining APIs to the BSVE
- Prototype near-realtime processing
- Build BSVE interface to GRITS with the SDK
- Connect GRITS expert network (GRITS.net) to the BSVE
- Test diagnostic dashboard with expert communities

Within 24 months of contract award:
- Enhance the expert annotation interface
- Build mechanisms to crowdsource annotations
- Incorporate disease network graphs to assist diagnostics
- Support diagnostic algorithm development with dashboard
- Expand diagnostic capability to arbitrary data feeds
- Connect GRITS to GRID
- Update diagnostic model in near-realtime
- Use text mining to extend network graphs/ontologies

Within 36 months of contract award:
- Crowdsource improvements to the GRITS media diagnostic tool
- Connect GRID's collective intelligence editor to the BSVE
- Connect GRITS diagnostic data filtering to the BSVE
- Enrich diagnostic dashboard with dynamic visualizations
- Generate disease summary reports from diagnostics
- Connect EcoHD to GRITS recommendations
- Create a webcrawler for expanding coverage of disease reports
- Forecast disease emergence

14. DISTRIBUTION	b. COPIES		
a. ADDRESSEE	Draft	Final	
		Reg	Repro
DTRA-J9CBA	0	1	0
DTRA/ J4LP	0	1	0
DTRA/ J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15. TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO	B. EXHIBIT	C. CATEGORY:			
N/A	K	TDP	TM	OTHER	Reports

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
Global Rapid Indentification Tool Set (GRITS)	TBD	EcoHealth Alliance

1. DATA ITEM NO.	2. TITLE OF DATA ITEM	3. SUBTITLE
A009	Scientific and Technical Reports	

4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-MISC-80711A	Statement of Work	DTRA-J9CBA

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION
LT		See Block 16	See Block 16
8. APP CODE		**11. AS OF DATE**	**13. DATE OF SUBSEQUENT SUBMISSION**
A		See Block 16	See Block 16

Blk 4-5: Per DID referenced elements, contractor format is acceptable. Report shall detail all work performed under this effort, including the results of analysis, and appropriate conclusions and/or recommendations. Dataset compatible with Microsoft Excel or contractor recommended database application.

A final technical report is required by the end of the base period. The report should include the following elements:

1) A description of the research and development processes used to arrive at the results of the study
2) A detailed compilation of the results generated
3) A description of the performance characteristics of the developed software and an analysis of its likely utility for additional development and deployment
4) Recommendations for the next stages of development
5) Description of what data are required to feed the delivered alorithms and an approach for the Government to maintain access to those data feeds.

Additionally, the contractor will deliver:

- Feedback on diagnostic dashboard (Updates provided each 12 months)
- Crowdsourced labels and annotations (36 months after contract award)
- EcoHD data for drivers of infectious disease (36 months after contract award)
- Documentation on near-realtime architecture (24 months after contract award)
- Documentation for GRITS APIs (Updates provided each 12 months)

Blk 14: Submission by electronic media is preferred; E-mail, or CD ROM in a current version of Microsoft or Adobe products readable by the COR.

14 DISTRIBUTION	b. COPIES		
a. ADDRESSEE	Draft	Final	
		Reg	Repro
	0	1	0
DTRA/ J4LP	0	1	0
DTRA/ J8CKF	0	1	0
DTRA-J4CRC	0	1	0
15 TOTAL	0	4	0

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE
(b)(6) S&T Manager		(b)(6) S&T Manager	

From: (b)(6)
To: Andrew Huff; "Karissa Whiting"
Cc: (b)(6) "Vasken.Kolancian@dcma.mil"; "Janette.fasano@sba.gov"; DTRA Ft Belvoir J4-8C Mailbox BFKF SPS Contracts; DTRA Ft Belvoir J9 List J9CB CB Contract Awards; (b)(6)
Subject: Incremental Funding Mod - HDTRA1-15-C-0041-P00001
Date: Monday, April 20, 2015 3:29:00 PM
Attachments: HDTRA1-15-C-0041-P00001.pdf

Base year is now fully funded.

(b)(6)
Senior Contract Specialist (Contractor)

Contracts - Research & Development Division (J4CRC)
Defense Threat Reduction Agency
Phone: (b)(6)
NEW Email: (b)(6)

Please take note of my new email address. The legacy address (b)(6) will be deleted shortly.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
S	1 3

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00001	20-Apr-2015	J9CBA14212	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DCMA GARDEN CITY 605 STEWART AVENUE GARDEN CITY NY 11530-4761	S3309A

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-15-C-0041
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 09-Apr-2015

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
52.232-22 Limitation of Funds

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: bishopb151339

The purpose of this modification is to:

1. Add incremental funding to CLIN 0001 in the amount of $99,550.79 under Sub-Clin 000101.
2. Update clauses 252.232-9000 and 252.232-9001.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 20-Apr-2015

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000101 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101			Lot		$0.00
	IF Funding				
	COST				
	FOB: Destination				
				ESTIMATED COST	$0.00
	ACRN AB				$99,550.79
	CIN: J9CBA16659000101				

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000101:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $99,550.79 from $2,117,486.21 to $2,217,037.00.

SUBCLIN 000101:
Funding on SUBCLIN 000101 is initiated as follows:

ACRN: AB

CIN: J9CBA16659000101

Acctng Data: 044315 097 0400 000 N 20152016 D 2620 0602384BP_CB_CBA_RC 1516_0400_2620_TM2DN DTRA 255

Increase: $99,550.79

Total: $99,550.79

The following have been modified:

252.232-9000 CONTRACT FUNDING PROFILE (OCT 1998)

Subject to FAR Clause 52.232-22, Limitation of Funds, the amount of $2,217,037.00 is obligated for work to be performed during the period beginning with contract award and continuing through the end of the base period. Additional incremental funding planned, but not obligated, is: $0.00.

(End of clause)

252.232-9001 PRICES/COST

a. Subject to the provisions of the Clauses of this Contract entitled LIMITATION OF FUNDS, ALLOWABLE COST AND PAYMENT, and FIXED FEE, the total allowable cost under this Contract shall not exceed S_____ A_____, which is the total estimated cost of the Contractor's performance hereunder, exclusive of fixed fee. In addition, the Government shall pay the Contractor a fixed fee of S_____B_____ for the performance of this Contract. It is understood and agreed that the Government's obligation is limited to INCREMENTAL FUNDING in the amount of $_____C_____. Within this amount (S_____C_____), the fixed fee shall bear the same relationship to the total fixed fee, as the costs incurred bear to the total estimated cost.

b. Interim payment vouchers may be submitted for provisional payment pursuant to the Clauses of this Contract entitled ALLOWABLE COST AND PAYMENT and FIXED FEE.

Fill in the dollar amounts as applicable:

CLIN 0001

A: $2,217,037.00
B: $0
C: $2,217,037.00

(End of Summary of Changes)

DEFENSE THREAT REDUCTION AGENCY
AND
UNITED STATES STRATEGIC COMMAND CENTER
FOR COMBATING WEAPONS OF MASS DESTRUCTION
8725 JOHN J. KINGMAN ROAD, STOP 6201
FORT BELVOIR, VA 22060-6201

OPENING NEGOTIATIONS

March 18, 2015

Dr. Andrew Huff,

A. On behalf of the DTRA Contracting Officer, I am writing to officially open negotiations with respect to EcoHealth Alliance's Proposal # HDTRA114-AMD1-CBA-03-2-0022. The following are the negotiation topics to be resolved:

1. Labor

	Proposed		Position		Difference	
	Hours	**Total**	**Hours**	**Total**	**Hours**	**Total**
Base Period	20,384	$ 856,600.00	18,304	$ 769,598.08	2,080	$ 87,001.92
Option I Period	20,384	$ 882,298.00	18,304	$ 787,298.84	2,080	$ 94,999.16

a. Labor Category: EcoHealth's original proposal did not include a Program Assistant (I), however began including this labor category in all future iterations of the proposal beginning November 3, 2014. The requirements of the SOW have not changed, therefore based on the technical evaluators recommendation, this additionally proposed labor is not required to fulfill the requirements in the statement of work.

DTRA's Position: Remove this labor category for each year of the contract, reducing the hours from 20,384 to 18,304 for each year of this effort.

b. Labor Rate: EcoHealth has proposed two Research Assistant (I)'s throughout all revisions of their proposal. From their revision dated January 6, 2015 onward, the labor rate for the two Research Assistant (I)'s has almost doubled from what was originally proposed – from $19.23 p/h to $36.06 p/h. Additional research indicates that these labor categories have been proposed for previous efforts with rates more comparable ($17.15 p/h) to the lesser of the two.

DTRA's Position: Accept the originally proposed rate of $19.23 p/h.

c. Labor Escalation: DTRA does not agree with EcoHealth's proposal of a 3% labor escalation rate for Option Period I of the period of performance. According to the Bureau of Labor Statistics for the private industry, labor escalation is expected to rise at a rate of 2.3%.

DTRA's Position: Apply labor escalation of 2.3% to Option Period I.

2. Travel

Year of Travel	Proposed	Position	Difference
Base	$15,328.00	$9,887.50	$5,440.50
Option I	$10,753.20	$6,744.17	$4,009.03

DTRA has taken exception to EcoHealth's proposed pricing with respect to airfare, per diem, lodging, transportation, trainfare, and annual escalation costs. DTRA's market research resulted in lower rates across the board when utilizing Government mandated regulations and third party travel websites.

DTRA's Positions:

a. Airfare: Roundtrip, coach flying rates were researched by utilizing two different time frames. The first was with 7 days advanced notice. The second method was using 6 months' notice. Comparable rates were obtained for both time frames.
b. Per Diem: For a two day trip, per diem is paid at 75% of the rate for the first day and 100% of the second day. Any other trip length is calculated at 75% of the rate on the first and last day, 100% on days in between.
c. Lodging: Calculated using GSA travel rates.
d. Transportation: DTRA understands that local travel in expensive areas can add up, however research indicates that multiple modes, multiple times should not exceed $60 per person in NY and $30 per person elsewhere, especially when utilizing public transportation.
e. Trainfare: Calculated from Penn Station (New York, NY) to Albany-Rensselaer (Near Clifton Park, NY).
f. Escalation: DTRA takes exception to the proposed 3% price increase for Option Period I. From 2014 to 2015, GSA per diem rates remained unchanged and lodging rates increased by 1.37%. To account for uncertainties in the travel industry, DTRA will round this percentage up to 1.5% and use this as the basis for their position.

DTRA's determined positions for Travel:

Trip 1			
From: New York, NY			
To: Boston, MA			
Days	2		
Travelers	2		
	Proposed	**Position**	**Difference**
Airfare	$800.00	$ 500.00	$300.00
Per Diem	$284.00	$ 248.50	$35.50
Lodging	$1,000.00	$ 516.00	$484.00
Transportation Boston	$120.00	$ 70.00	$50.00
Local Transport NY	$120.00	$ 120.00	$0.00
Total	**$2,324.00**	**$ 1,454.50**	**$ 869.50**

Trip 2			
From: New York, NY			
To: Carrboro, NC			
Days	2		
Travelers	2		
	Proposed	**Position**	**Difference**
Airfare	$1,000.00	$ 700.00	$300.00
Per Diem	$224.00	$ 196.00	$28.00
Lodging	$500.00	$ 194.00	$306.00
Transportation Carrboro	$120.00	$ 75.00	$45.00
Local Transport NY	$120.00	$ 120.00	$0.00
Total	**$1,964.00**	**$ 1,285.00**	**$ 679.00**

Trip 3			
From: New York, NY			
To: Clifton Park, NY			
Days	2		
Travelers	2		
	Proposed	**Position**	**Difference**
Train Fare	$400.00	$ 320.00	$80.00
Per Diem	$224.00	$ 196.00	$28.00
Lodging	$500.00	$ 356.00	$144.00
Transportation Clifton Park	$120.00	$ 60.00	$60.00
Local Transport NY	$200.00	$ 120.00	$80.00
Total	**$1,444.00**	**$ 932.00**	**$ 312.00**

Trip 4			
From: New York, NY			
To: Washington DC			
Days	2		
Travelers	2		
	Proposed	**Position**	**Difference**
Airfare	$1,000.00	$ 600.00	$400.00
Per Diem	$284.00	$ 248.50	$35.50
Lodging	$1,000.00	$ 458.00	$542.00
Transportation DC	$120.00	$ 60.00	$60.00
Local Transport NY	$200.00	$ 120.00	$80.00
Total	**$2,604.00**	**$ 1,486.50**	**$ 1,117.50**

Trip 5			
From: New York, NY			
To: Washington DC			
Days	2		
Travelers	2		
	Proposed	**Position**	**Difference**
Airfare	$500.00	$ 600.00	-$100.00
Per Diem	$284.00	$ 248.50	$35.50
Lodging	$1,000.00	$ 458.00	$542.00
Transportation DC	$120.00	$ 60.00	$60.00
Local Transport NY	$200.00	$ 120.00	$80.00
Total	**$2,104.00**	**$ 1,486.50**	**$ 617.50**

Trip 6			
From: New York, NY			
To: TBD			
Days	4		
Travelers	2		
	Proposed	**Position**	**Difference**
Airfare	$1,000.00	$ 1,000.00	$0.00
Per Diem	$568.00	$ 497.00	$71.00
Lodging	$3,000.00	$ 1,506.00	$1,494.00
Transportation TBD	$120.00	$ 120.00	$0.00
Local Transport NY	$200.00	$ 120.00	$80.00
Total	**$4,888.00**	**$ 3,243.00**	**$ 1,645.00**

3. Other Direct Costs (ODCs)

ODCs	Proposed	Position	Difference
Base Period	$ 30,305.72	$ 29,670.00	$ 635.72
Option Period I	$ 30,493.89	$ 29,462.49	$ 1,031.40

a. Data Purchasing: This $2,400 cost was challenged in a previous contract and additional data was provided to substantiate it. S473 of this charge that was previously justified was for Online Safari Subscriptions, which was proposed separately for this effort under "Books and Reference Material."

DTRA's Position: Reduce the proposed $2,400 by $473.

b. Books & Reference Materials: DTRA takes exception to the proposed cost of $711.72. Research indicates that a Safari Books Online Teams Account is cheaper to purchase annually (S399) than to pay $39 per month for a Pro Account, thus saving $162.72.

DTRA's Position: Purchase of Annual Teams Account.

c. Escalation: DTRA takes exception to the proposed 3% increase for Option Period I. Researching current PPI numbers, the average CPI increase from 2012 through 2014 was 1.7%, therefore this will be the factor that DTRA will apply to the Base Period positions to develop positions for Option Period I. The Positions noted above for Option I reflect a 1.7% increase over the base year positions.

DTRA's Position: Apply 1.7% as the annual escalation factor.

4. Subcontractor Costs

a. International Society for Infectious Diseases

Base Summary		Proposed	Position	Difference
Direct Labor		$ 31,972.38	$ 31,972.38	$ -
Travel		$ 2,696.00	$ 3,003.00	$ (307.00)
ODCs		$ 64,019.90	$ 64,019.90	
Fringe	30.00%	$ 9,591.71	$ 9,591.71	$ -
G&A	15.00%	$ 16,242.00	$ 16,288.05	$ (46.05)
Total		**$ 124,521.99**	**$ 124,875.04**	**$ (353.05)**
Option I Summary		**Proposed**	**Position**	**Difference**
Direct Labor		$ 32,931.55	$ 32,707.74	$ 223.81
Travel		$ 2,776.88	$ 3,048.05	$ (271.17)
ODCs		$ 65,940.50	$ 65,940.50	
Fringe	30.00%	$ 9,879.47	$ 9,812.32	$ 67.14
G&A	15.00%	$ 16,729.26	$ 16,726.29	$ 2.97
Total		**$ 128,257.65**	**$ 128,234.90**	**$ 22.75**

i. Labor Escalation: DTRA takes exception to ISID's proposal of a 3% labor escalation rate for Option Period I of the period of performance. According to the Bureau of Labor Statistics for the private industry, labor escalation is expected to rise at a rate of 2.3%.

DTRA's Position: Apply labor escalation of 2.3% to Option Period I.

ii. Travel Airfare: Proposed airfare was priced lower than what market research yielded in the open market. Pricing was determined in the same manner as mentioned above under paragraph 2, Travel.

DTRA's Position: Increase airfare by $100 per trip.

iii. Travel Loding: Lodging was not proposed in accordance with approved GSA travel rates.

DTRA's Position: Apply GSA rates.

iv. Travel Per Diem: Per diem was not proposed in accordance with approved GSA travel rates.

DTRA's Position: Apply GSA rates.

v. Travel Escalation: DTRA takes exception to the proposed 3% price increase for Option Period I. From 2014 to 2015, GSA per diem rates remained unchanged and lodging rates increased by 1.37%.

DTRA's Position: To account for uncertainties in the travel industry, DTRA will round this percentage up to 1.5%.

vi. Indirect Rates: No exceptions were taken with the proposed indirect rates, however the costs reflect differences due to the exceptions taken within other cost pools noted above.

b. Kitware

Base Summary				
		Proposed	Position	Difference
Direct Labor		$ 182,466.06	$ 182,466.06	$ -
Travel		$ 4,832.00	$ 5,538.00	$ (706.00)
Indirect	82.80%	$ 155,082.80	$ 155,667.36	$ (584.57)
G&A	38.40%	$ 131,474.25	$ 131,969.83	$ (495.58)
Sub-Total		$ 473,855.11	$ 475,641.25	$ (1,786.15)
Fee	7% | 5.5%	$ 32,831.62	$ 25,855.68	$ 6,975.94
Total		**$ 506,686.72**	**$ 501,496.93**	**$ 5,189.79**

Option I Summary				
		Proposed	Position	Difference
Direct Labor		$ 187,940.04	$ 186,662.78	$ 1,277.26
Travel		$ 4,976.96	$ 5,621.07	$ (644.11)
Indirect	82.80%	$ 159,735.28	$ 159,211.03	$ 524.25
G&A	38.40%	$ 135,418.48	$ 134,974.03	$ 444.44
Sub-Total		$ 488,070.76	$ 486,468.91	$ 1,601.85
Fee	7% | 5.5%	$ 33,816.57	$ 26,446.63	$ 7,369.93
Total		**$ 521,887.33**	**$ 512,915.55**	**$ 8,971.78**

i. Labor Escalation: DTRA takes exception to Kitware's proposal of a 3% labor escalation rate for Option Period 1 of the period of performance. According to the Bureau of Labor Statistics for the private industry, labor escalation is expected to rise at a rate of 2.3%.

DTRA's Position: Apply labor escalation of 2.3% to Option Period I.

ii. Travel – Airfare: Proposed airfare was priced lower than what market research yielded in the open market. Pricing was determined in the same manner as mentioned above under paragraph 2, Travel.

DTRA's Position: Increase airfare by $100 per trip for the first two trips; increase by $280 for the last two.

iii. Travel – Loding: Lodging was not proposed in accordance with approved GSA travel rates.

DTRA's Position: Apply GSA rates.

iv. Travel – Per Diem: Per diem was not proposed in accordance with approved GSA travel rates.

DTRA's Position: Apply GSA rates.

v. Travel – Trainfare: Rates proposed were low based on market research for trainfare from Penn Station (New York, NY) to Albany-Rensselaer (Near Clifton Park, NY).

DTRA's Position: Increase to $160 ($80 each way) for the trainfare.

vi. Travel Escalation: DTRA takes exception to the proposed 3% price increase for Option Period I. From 2014 to 2015, GSA per diem rates remained unchanged and lodging rates increased by 1.37%.

DTRA's Position: To account for uncertainties in the travel industry, DTRA will round this percentage up to 1.5%.

vii. Indirect Rates: No exceptions were taken with the proposed indirect rates, however the costs reflect differences due to the exceptions taken within other cost pools noted above.

viii. Fixed Fee: DTRA takes exception to the 7% proposed fee by Kitware for this effort. DTRA's analysis of fee in accordance with DFARS 215.404-71, also removing travel costs from the fee calculation, which is DTRA policy, resulted in a fee value of $52,302.31 or 5.5% of the total estimated cost less travel.

DTRA's Position: Apply 5.5% to determine the fixed fee amount of $52,302.31.

5. Indirect Cost Rates DTRA accepts all indirect cost rates as proposed. The amounts differ from what is proposed due to DTRA's exceptions to EcoHealth's proposed pricing outlined in the areas above.

6. VETS100 EcoHealth has submitted evidence that they have submitted their VETS 100 report, however a copy was not furnished to DTRA. A copy will be required prior to award. Please provide this at your earliest convenience.

7. Subcontracting Plan EcoHealth will be required to update their Subcontracting Plan to reflect negotiated prices and address requirements set forth by FAR 19.704(a) prior to contract award. Please provide this at your earliest convenience.

8. FAR & DFAR Provisions – EcoHealth will need to fill out and submit the following provisions prior to award:

    1. DFARS 252.203-7998
    2. DFARS 252.209-7992
    3. DFARS 252.222-7007
    4. DFARS 252.225-7050

    An attachment including each clause have been forwarded for convenience. Please sign and return.

B. Stemming from the topics cited above, DTRA's position with respect to the cost-plus-fixed-fee value for this effort is as follows:

Base Summary				
	Rate	Proposed	Position	Difference
Labor Hours		20,384.00	18,304.00	2,080.00
Direct Labor		$ 856,600.00	$ 769,598.08	$ 87,001.92
Travel		$ 15,328.00	$ 9,887.50	$ 5,440.50
ODCs		$ 30,305.72	$ 29,670.00	$ 635.72
Subcontractors		$ 631,208.72	$ 626,371.97	$ 4,836.74
Fringe	35.10%	$ 300,666.60	$ 270,128.93	$ 30,537.67
G&A	44.20%	$ 564,831.94	$ 510,193.75	$ 54,429.12
Total		**$ 2,398,940.98**	**$ 2,215,850.23**	**$ 183,090.75**

Option I Summary				
	Rate	Proposed	Position	Difference
Labor Hours		20,384.00	18,304.00	2,080.00
Direct Labor		$ 882,298.00	$ 787,298.84	$ 94,999.16
Travel		$ 10,753.20	$ 6,744.17	$ 4,009.03
ODCs		$ 30,493.89	$ 29,462.49	$ 1,031.40
Subcontractors		$ 650,144.98	$ 641,150.45	$ 8,994.53
Fringe	35.15%	$ 310,127.75	$ 276,735.54	$ 33,392.21
G&A	44.25%	$ 579,087.73	$ 520,044.16	$ 58,830.71
Total		**$ 2,462,905.55**	**$ 2,261,435.64**	**$ 201,469.91**

C. Please respond to each of the eight (8) items above. Upon our concurrence on all eight (8), I will close negotiations and begin the award process. Let me know should you have any questions.

Sincerely,

BISHOP.BRIAN.WAYNE.1267013124

Digitally signed by BISHOP.BRIAN.WAYNE.1267013124
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=CONTRACTOR, cn=BISHOP.BRIAN.WAYNE.1267013124
Date: 2015.03.18 11:30:46 -04'00'

Brian Bishop
Contract Specialist (Contractor Support)

Attachments:

1. DFARS 252.203-7998
2. DFARS 252.209-7992
3. DFARS 252.222-7007
4. DFARS 252.225-7050

From: Dr. Andrew Huff
To: (b)(6)
Subject: Re: FW: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization
Date: Tuesday, January 6, 2015 3:22:24 PM
Attachments: EcoConcerns AGH 01062016.xlsx
EHA- COST SUMMARY-01062015.xlsx
Epidemico - COST BREAKOUT 01062016.xlsx
Epidemico License&Data Letter 01062015.pdf
ISID - COST BREAKOUT 01062015.xlsx
Kitware- COST BREAKOUT 01062015.xlsx

Hi (b)(6)

We have corrected the errors that you identified. Also, a letter of explanation is provided from Epidemico related to data purchases. Thank you for your attention to detail! As we grow as an organization, I assure you we will continue to improve.

* What are the next steps in the process?

Cheers,

Andrew

(b)(6) wrote:

Sounds good, thank you Sir!

(b)(6) Contractor Support
Sr. Contract Specialist
JAB Solutions, LLC

Phone (b)(6)
Email

-----Original Message-----
From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Monday, January 05, 2015 1:10 PM
To: (b)(6)
Subject: Re: FW: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

H (b)(6)

We have everything corrected. We are waiting on our sub (Epidemico) to provide us with a brief letter or document stating that the licensing fee is for data that is not publicly available via their website. Hopefully this document arrives today.

Best,

Andrew

Number	Contractor	Cost Category	Concern	Response
1	Eco	Labor	Last labor cost was not included in the cost. Please correct.	Our apologies. We corrected the error. This must have been an artifact since the program assistant's salary was
2	Eco	Subcontractors	Table is confusing as it lists Kitware two times in the base period, then a 3rd time listed under Option I. Please correctly identify which sub and cost goes into which year of the proposed contract.	Our apologies. We corrected the error.
3	Eped	ODCs	$10,000 license fee? The website appears free, can you submit something to support this charge?	The Healthmapper website is free and publicly available, but a direct link to the raw data (used and analyzed by the website) is not. We have obtaed abrief document from the subcontractor to explain that the data are not
4	ISID	Labor	Larry Madoff, Editor, $88-$90 p/h seems extremely excessive for an editor based on market research. What makes this position so unique?	Good question. Dr. Larry Madoff is the world's leading expert and authority on biosurveillence. He has over 30 years experience in biosurveillince and is the person that manages ProMED (the world's largest and most frequently used platform for biosurveillence). His expertise and professional network exceeds anyone else in thje field. He is able to provide expertise that no one else has in international biosurveillence. In fact his rate is
5	ISID	ODCs	Consultant - Copy Editor rate is incorrect on ISID's breakout. They state 160 hours at $28.84 = $4,760. That is incorrect, the correct charge should be $4,614.40. This impacts indirect costs and the figures on your prime proposal since this will change the dollar amounts throughout	Thank you for catching this. We have corrected the figures throughout. Also, we noticed that the incorrect equipment costs were listed and we corrected this.

COST SUMMARY

Cost Element	Base Period			Option I			Option II			Option III			Option IV		
	Rate/Hrly	Quantity/Hrs	Total Amount	Rate/Hrly	Quantity/Hrs	Total Amount	Rate/Hrly	Quantity/Hrs	Total Amount	Rate/Hrly	Quantity/Hrs	Total Amount	Rate/Hrly	Quantity/Hrs	Total Amount
Senior Research Scientist	$ 67.31	2080	$ 140,000	69.329230769	2080	$ 144,200.00	$	XX	$	$	XX	$	$	XX	$
Senior Software Developer/IIT	$ 50.06	2080	$ 104,000	52.490384615	2080	$ 109,180.00	$	XX	$	$	XX	$	$	XX	$
Senior Data Scientist/IIT	$ 50.06	2080	$ 104,000	52.490384615	2080	$ 109,180.00	$	XX	$	$	XX	$	$	XX	$
Data Scientist/IIT	$ 43.33	240	$ 24,000	45.80625	1248	$ 57,159.00	$	XX	$	$	XX	$	$	XX	$
Research Scientist/IIT	$ 21.01	2080	$ 30,000	21.539663358	2080	$ 44,800.00	$	XX	$	$	XX	$	$	XX	$
Research Associate/IIT	$ 36.06	240	$ 15,000	37.13942308	1248	$ 46,350.00		XX			XX			XX	
Research Associate/IIT	$ 36.06	240	$ 15,000	37.13942308	1248	$ 46,350.00		XX			XX			XX	
Senior Software Developer/IIT	$ 49.57	2080	$ 103,000	51.004807692	2080	$ 106,050.00	$	XX	$	$	XX	$	$	XX	$
Research Assistant/IIT	$ 21.63	2080	$ 45,000	$22.28	2080	$46,350.00									
Software Developer/IIT	$ 38.94	2080	$ 81,000	40.11057692	2080	$ 83,430.00	$	XX	$	$	XX	$	$	XX	$
Software Developer/IIT	$ 38.94	2080	$ 81,000	40.11057692	2080	$ 83,430.00	$	XX	$		XX			XX	
TOTAL DIRECT LABOR		XX	$ 850,000		XX	$ 875,299	$	XX	$		XX	$		XX	$
ADDITIONAL BURDEN	Rate	Dir Burden Applied to	Total Amount	Rate	Dir Burden Applied to	Total Amount	Rate	Dir Burden Applied to	Total Amount	Rate	Dir Burden Applied to	Total Amount	Rate	Dir Burden Applied to	Total Amount
FRINGE BENEFITS	33.45%	$ 850,000.00	$ 284,324	33.45%	$ 875,299	$ 292,815.81	%	$	$ 97,917.51	%	$	$	%	$	$
OVERHEAD		$		%	$	$	%	$	$	%	$	$	%	$	$
TOTAL LABOR BURDEN			$ 1,142,704			$ 1,168,114			$			$			$
TOTAL MATERIAL/EQUIPMENT			$21,987			$			$			$			$
TOTAL TRAVEL COSTS			$ 15,428			$ 15,820			$			$			$
TOTAL ALL OTHER DIRECT COSTS			$59,011			$ 248,242			$			$			$
TOTAL SUBCONTRACTOR COSTS			$984,174			$ 1,006,9			$			$			$
TOTAL DIRECT COSTS			$ 2,224,105			$ 2,262,897			$			$			$
G&A/F&A/OVHD	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A OR F&A	44.11%	$ 1,312,931	$ 578,889	22.1%	$ 524,924	$ 582,117	%	$	$	%	$	$	%	$	$
ADDITIONAL ALLOWABLE DIRECT COSTS (Explain in Narrative)			$ -			$			$			$			$
TOTAL COSTS			$ 2,803,030			$ 2,845,013			$			$			$
FEE/PROFIT	Fee Rate	% Rate Applied to Direct excluding Travel & ODC's	Total Amount	Fee Rate	Fee Rate Applied to total cost, excluding travel and ODC's	Total Amount	Fee Rate	Fee Rate Applied to total cost, excluding travel and ODC's	Fee Amount	Fee Rate	Fee Rate Applied to total cost, excluding travel and ODC's	Fee Amount	Fee Rate	Fee Rate Applied to total cost, excluding travel and ODC's	Fee Amount
FEE/OUT PROFIT	%	$	$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$ 2,803,030			$ 2,845,013			$			$			$

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information
Computers	Apple	15" MacBook Pro	$2,499	5	$12,495	3 year lease	Current prices available on the catalog published by Purchasing Cooperative at http://store.apple.com/us/browse/home/shop_mac/family/macbook_pro/15
Monitors	Apple	Thunderbolt Display	$999.00	7	$6,993	3 year lease	Current prices available on http://store.apple.com/us/product/MD464LL/B?mco=MTY3NTUzNg Apple thunderbolt display 27" may include $31 Part # MD464LL/B
					$19,488		

Note:
Peripherals may be listed as a lump sum or individual items over $5,000. Individual items that are over $5,000 are separately from the rest of the consumable group

TRAVEL

Trip #:	1	Location:	Boston, MA (HealthMap and ProMED-mail)			Contract Period
Purpose:	Meet with HealthMap and ProMED-mail editors					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$800.00	$284.00	$1,000.00	$240.00	$2,324.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Boston	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	2	Location:	Carrboro, NC (Kitware)			Contract Period
Purpose:	Meet with Kitware database team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$224.00	$500.00	$240.00	$1,964.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Carrboro	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	3	Location:	Clifton Park, NY (Kitware)			Contract Period
Purpose:	Meet with Kitware visualization team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2		$224.00	$500.00	$720.00	$1,444.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$400.00
Transportation in Clifton Park/Albany	$120.00
Local transport NYC	$200.00
Total:	$720.00

Trip #:	4	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$284.00	$1,000.00	$320.00	$2,604.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	5	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$1,000.00	$320.00	$2,104.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	6	Location:	TBD (Digital Disease Detection Conference)			Contract Period
Purpose:	Attend Digital Disease Detection Conference hosted by HealthMap					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
4	2	$1,000.00	$568.00	$3,000.00	$320.00	$4,888.00

Itemized Expenses for "Other"

Description	Amount
nsportation to/from airport and during confere	$120.00
Local transport NYC	$200.00

Total:	$320.00

OTHER DIRECT COSTS

Description	Total Price	Contract Period	Additional Information
			List detailed description and additional information stating the need for the requirement and the method with which the total cost was calculated. Example: Twenty hours of laboratory usage is required to complete Task 4 and was calculated at a rate of $200 per hour. Laboratory hours were estimated based on experience with previous efforts of a similar size
Cloud Processing Services	$17,094	Base Period	Commercial cloud processing for modeling, data analysis, software development, and web hosting. Estimate is
Domain Registrar	$ 160	Base Period	Annual cost for domain name and security certificates
Cloud Application Services	$ 840	Base period	Cost of Google Apps Services and data hosting ($10 per user per month for google apps with unlimited
Data Purchasing	$ 2,400	Base Period	Additional global datasets will be purchased based on priority diseases and regions identified in consultation
Code Hosting	$2,400	Base Period	Estimate is based on the monthly cost of a github.com platinum plan
Books and reference materials	$711.72	Base Period	Estimate is a subscription to Safari Books Online ($46.81/month), plus 5 additional book purchases at $30
Software Licenses	$1,000	Base Period	Additional licenses for software such as text editors and office tools (estimated $100 per person)
Publication Fees	$4,500.00	Base Period	Calculated based on average publication fee for PLoS (Public Library of Science) journals (2 publications x
Meeting Costs	$500.00	Base Period	This will support two all-day meetings with the partners at the EcoHealth Alliance office in NY. It covers
Recruiting	$700	Base Period	2 job listings at $350 per 30-day listing on StackOverflow careers
Cloud Processing Services	$17,094	Option Year 1	Commercial cloud processing for modeling, data analysis, software development, and web hosting. Estimate is
Domain Registrar	$ 160	Option Year 1	Annual cost for domain name and security certificates
Cloud Application Services	$ 840	Option Year 1	Cost of Google Apps Services and data hosting ($10 per user per month for google apps with unlimited
Data Purchasing	$ 2,400	Option Year 1	Additional global datasets will be purchased based on priority diseases and regions identified in consultation
Code Hosting	$2,400	Option Year 1	Estimate is based on the monthly cost of a github.com platinum plan
Books and reference materials	$711.72	Option Year 1	Estimate is a subscription to Safari Books Online ($46.81/month), plus 5 additional book purchases at $30
Software Licenses	$1,000	Option Year 1	Additional licenses for software such as text editors and office tools (estimated $100 per person)
Publication Fees	$4,500.00	Option Year 1	Calculated based on average publication fee for PLoS (Public Library of Science) journals (2 publications x
Meeting Costs	$500.00	Option Year 1	This will support two all-day meetings with the partners at the EcoHealth Alliance office in NY. It covers
	$59,911		

SUBCONTRACTORS

Company Name	Total Price	Contract Period	Additional Information
Kitware	$503,580	Base Period	
Epidemico	$356,071.82	Base Period	
ISID	$124,521.99	Base Period	
Kitware	$518,687.69	Option I	
Epidemico	$366,423.97	Option I	
ISID	$128,257.65	Option I	

Cost Elements	Base Period			Option I								
	Rate Info	Quantity	Total Amount	Rate Info	Quantity	Total Amount	Rate Info	Quantity	Total Amount	Rate Info	Quantity	Total Amount
Labor Category & Title							N	XX	N	N	XX	N
Project Manager	$[illegible]25	[illegible]10	$[illegible]5,247.50	$[illegible]79.57	[illegible]10	$[illegible]56,492.97	N	XX	N	N	XX	N
Clerk Typist II, Senior Software Programmer	$[illegible]5.00	[illegible]10	$[illegible]4,053.00	$[illegible]5,965	[illegible]10	$[illegible]4,[illegible]21.90	N	XX	N	N	XX	N
Lead Developer, Software Programmer	$[illegible]4.55	[illegible]10	$[illegible]62.[illegible]3.50	$[illegible]6,[illegible]6.05	[illegible]10	$[illegible]66,[illegible]3.72	N	XX	N	N	XX	N
Senior Client-Server Software Developer	$[illegible]7.10	[illegible]10	$[illegible]1,[illegible]7.50	$[illegible]43.[illegible]6	[illegible]10	$[illegible]54,[illegible]3.68						
Client Project Manager	$[illegible]9.51	[illegible]15	$[illegible]3,[illegible]6.65	$[illegible]40.[illegible]21	[illegible]15	$[illegible]7,[illegible]2.02						
Data Base Administrator	$[illegible]2.41	[illegible]10	$[illegible]1,462.10	$[illegible]30.[illegible]47	[illegible]10	$[illegible]1,[illegible]5.86	N	XX	N	N	XX	N
TOTAL DIRECT LABOR		$[illegible]65	$[illegible]1,[illegible]05.65		$[illegible]65	$[illegible]2[illegible]1,[illegible]58.82		XX	N		XX	N
LABOR BURDEN	Rate		Total Amount	Rate	Per Daily Applied To	Total Amount	Rate	Per Daily Applied To	Total Amount	Rate	Per Daily Applied To	Total Amount
FRINGE BENEFITS	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N
OVERHEAD	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N
TOTAL LABOR BURDEN			$[illegible]1,[illegible]05.65			$[illegible]26,[illegible]35.82			N			N
TOTAL MATERIAL EQUIPMENT			$[illegible]0.00			$[illegible]0.01			N			N
TOTAL TRAVEL COSTS			$[illegible]6[illegible]8.00			$[illegible]4,[illegible]2.42			N			N
TOTAL ALL OTHER DIRECT COSTS			$[illegible]3,[illegible]0.00			[illegible]0.01			N			N
TOTAL SUBCONTRACTOR COSTS			$[illegible]0.00			0			N			N
TOTAL DIRECT COSTS			$[illegible]2,[illegible]3.65			$[illegible]34,[illegible]03.36			N			N
G&A, F&A, FCCM	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount
G&A OR F&A	[illegible]0.00%	$[illegible]24,[illegible]65.65	$[illegible]2,[illegible]65.37	[illegible]0.00%	$[illegible]34,[illegible]45.36	$[illegible]3,[illegible]07.53	[illegible]%	N	N	[illegible]%	N	N
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			N			N			N			N
TOTAL COSTS			$[illegible]5,[illegible]14.02			$[illegible]7,[illegible]05.89			N			N
FEE/PROFIT	Fee Rate	Fee Rate Applied To, Total Cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied To, Total Cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied To, Total Cost excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied To, Total Cost excluding travel & FCCM	Total Amount
FEE OR PROFIT	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N	[illegible]%	N	N
TOTAL COST PLUS FEE			N			N			N			N

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if numerical items over $5,000. For these items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (GeoHealth Alliance)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$700.00	$284.00	$600.00	$240.00	$1,824.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and BSVE)		Contract Period	
Purpose:	Meet with DTRA and the BSVE team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$700.00	$284.00	$600.00	$240.00	$1,824.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
							$0.00

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
HealthMap License Fee	$110,000	Base Period	HealthMap data license fee
HealthMap License Fee	$110,000	Option Year 1	HealthMap data license fee

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

epidemico

January 6, 2015

Zach Gold
EcoHealth Alliance
460 West 34th Street
17th floor New York, NY 10001

Zach,

Epidemico has developed proprietary software and operates HealthMap databases, websites, algorithms, database architectures and news sites (the "HealthMap System") which collect, aggregate, analyze and disseminate information relating to world-wide infectious disease outbreaks and health-related incidents (the "Information"). The software is available for license where licensee has rights to use the platform and receive real time data feeds.

Should you need any further assistance, please do not hesitate to contact me, at kelly@epidemico.com or +1(617) 938-0252.

Sincerely,

Kelly Wahlberg
Chief Financial Officer
Epidemico, Inc.

COST SUMMARY

	Base Period			Option I								
Cost Element	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount
Labor Category & Title							$	XX	$	$	XX	$
Lam, Xuan (Tom) Tester	$88.70	192	$17,030	$91.36	192	$17,541.31	%	XX	%	%	XX	%
[illegible] IT Manager	$15.53	366	$5,682	$30.24	366	$13,393.24	%	XX	%	%	XX	%
							%	XX	%	%	XX	%
							%	XX	%	%	XX	%
							%	XX	%	%	XX	%
TOTAL DIRECT LABOR		[illegible]	$31,972.56		[illegible]	$32,931.55		XX	%		XX	%
LABOR BURDEN	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount
FRINGE BENEFITS	30%	$31,972.56	$9,591.77	30%	$32,931.55	$9,879.47	%	%	%	%	%	%
OVERHEAD	%	%	%	%	%	%	%	%	%	%	%	%
TOTAL LABOR BURDEN			$9,591.77			$9,879.47			%			%
TOTAL MATERIAL EQUIPMENT			$[illegible]			$[illegible]			$			$
TOTAL TRAVEL COSTS			$[illegible]			$[illegible]			%			%
TOTAL ALL OTHER DIRECT COSTS			$[illegible]			$[illegible]			%			%
TOTAL SUBCONTRACTOR COSTS			$[illegible]			$[illegible]			$			$
TOTAL DIRECT COSTS			$[illegible]			$[illegible]			%			%
G&A + B&P + FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A + B&P + FCCM	15.00%	$[illegible]	$[illegible]	15.00%	$[illegible]	$[illegible]	%	%	%	%	%	%
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach completed DD Form 1861)			$			$			%			%
TOTAL COSTS			$[illegible]			$[illegible]			%			%
FEE/PROFIT	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount
FEE/PROFIT	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE						$			$			$

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Technical Information

Note:
Consumables may be listed as a lump sum if incremental items over $5,000. For these items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (EcoHealth Alliance)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$400.00	$284.00	$534.00	$120.00	$1,338.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and BSVI)		Contract Period	
Purpose:	Meet with DTRA and the BSVI team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$600.00	$284.00	$534.00	$120.00	$1,338.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
							$0.00

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
Consultant - M. Pollack, Deputy Editor	$15,720.00	Base Period	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $78.85 per hour.
Consultant - Associate Editor	$43,635.50	Base Period	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $22.15 per hour.
Consultant - Copy Editor	$4,614.40	Base Period	160 hours of work by a ProMed Copy Editor, calculated at a rate of $28.84 per hour.
Consultant - M. Pollack, Deputy Editor	$16,243.10	Option I	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $81.22 per hour.
Consultant - Associate Editor	$44,944.52	Option I	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $22.81 per hour.
Consultant - Copy Editor	$4,752.83	Option I	160 hours of work by a ProMed Copy Editor, calculated at a rate of $29.39 per hour.
Consultant - M. Pollack, Deputy Editor	16730.293	Option II	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $83.65 per hour.
Consultant - Associate Editor	$46,292.90	Option II	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $23.50 per hour.
Consultant - Copy Editor	$4,895.42	Option II	160 hours of work by a ProMed Copy Editor, calculated at a rate of $30.59 per hour.

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

COST SUMMARY

	Base Period			Option I								
Cost Element	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount
Labor Category & Title							$	XX	$	$	XX	$
Dr. Z. Beamer	$85.22	875.79	$40,272.86	$89.87	875.79	$41,461.05	%	XX	%	%	XX	%
Patrick Reynolds	$74.51	875.79	$37,42[illegible].86	$76.15	875.79	$38,547.61	%	XX	%	%	XX	%
R&D Engineer	$47.31	1,182.22	$52,3[illegible].17	$48.76	1,182.22	$53,955.69	%	XX	%	%	XX	%
R&D Engineer	44.31	1,182.22	$52,3[illegible].17	$45.6[illegible]	1,182.22	$53,955.69	%	XX	%	%	XX	%
							%	XX	%	%	XX	%
TOTAL DIRECT LABOR		4034.82	$182,468.66		4034.82	$187,920.14		XX	%		XX	%
LABOR BURDEN	Rate	Per Dollar Applied to	Total Amount	Rate	Per Dollar Applied to	Total Amount	Rate	Per Dollar Applied to	Total Amount	Rate	Per Dollar Applied to	Total Amount
FRINGE BENEFITS	0%	%	%	0%	%	%	0%	%	%	0%	%	%
OVERHEAD	0%	%	%	0%	%	%	0%	%	%	0%	%	%
TOTAL LABOR BURDEN			$182,468.66			$187,920.14			%			%
TOTAL MATERIAL			$0.00			$0.00			%			%
TOTAL TRAVEL			$6,852.00			$7,056.62			%			%
TOTAL ALL OTHER DIRECT COSTS			$0.00			$0.00			%			%
TOTAL SUBCONTRACTOR COSTS			$0.00			$0.00			%			%
TOTAL DIRECT COSTS			$381,789.32			$393,376.60			%			%
G&A / B&P / FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
Indirect Costs	52.00%	$381,789.32	$198,530.45	52.00%	$393,376.60	$204,556.03	0%	%	%	0%	%	%
G&A	34.00%	$580,227.47	$197,277.34	34.00%	$587,932.63	$199,897.10	0%	%	%	0%	%	%
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach completed DD Form 1861)			%			%			%			%
TOTAL COSTS			$777,597.12			$797,829.73			%			%
FEE / PROFIT	Fee Rate	Fee Rate Applied to Total Cost, excluding Travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost, excluding Travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost, excluding Travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost, excluding Travel & FCCM	Total Amount
FEE OR PROFIT	7.00%	$467,123.83	$32,698.67	7.00%	$481,237.43	$33,686.62	0%	%	%	0%	%	%
TOTAL COST PLUS FEE			$810,295.79			$831,516.35			%			%

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Technical Information

Note:
Consumables may be listed as a lump sum if incremental items over $5,000. For these items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$534.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	2		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$534.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	3		Location:	Washington, DC Area (DTR V and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
2	2		$420.00	$284.00	$354.00	$120.00		$1,178.00

Itemized Expenses for "Other"

Description	Amount
sportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

(b)(6) wrote:

Dr. Huff, I've completed my initial analysis on your cost proposal and have some concerns. Could you please see the attached excel document I'm using to track these and their resolution? Thank you.

(b)(6)
Contractor Support
Sr. Contract Specialist
JAB Solutions, LLC

Phone (b)(6)
Email:

-----Original Message-----
From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Monday, December 22, 2014 10:29 AM
To: (b)(6)
Subject: Re: FW: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Hi (b)(6)

Real quick- Would you like us to correct the document or are you correcting it?

Best,

Andrew

(b)(6) wrote:

The screen shot corroborates my assertion that the last value of $81,000 is not included in the total direct labor cost of $699,900. Attached is the document from which I am working. Thank you Sir!

(b)(6) Contractor Support

Sr. Contract Specialist

JAB Solutions, LLC

Phone (b)(6)

Email

From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Friday, December 19, 2014 11:54 AM
To: (b)(6)

Cc: (b)(6)

Subject: Re: FW: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Good morning (b)(6)

Below is a screenshot of the document that was sent to your predecessor. The missing value that you are referring to appears to be present in the last batch of documents that was requested and sent to (b)(6)

* Do you have the latest documents? - Please send me copies and I then I can verify that we are looking at the same docs.

This seemed to be a problem before you were assigned to this project (b)(6) looking at old documents). I will verify your version of the docs asap and then we can eliminate any potential confusing that may be occurring.

Thank you for being on top of this!

Best,

Andrew

(b)(6) wrote:

Dr. Huff, I'm looking over your Cost Summary and it appears that on the "Cost Summary" Tab, Total Direct Labor is missing the last labor category, Software Developer (II) in the total. This happens for both the Base and Option Year. I presume you'd like to add them into the cost summary? This will push the award value to $5,245,914, assuming the rest of the spreadsheet is correctly calculating indirects.

Please look over this and make any corrections that you feel should be made to correct this. Thank you in advance!

(b)(6)
Contractor Support
Sr. Contract Specialist
JAB Solutions, LLC

Phone: (b)(6)
Email:

-----Original Message-----

From: (b)(6)
Sent: Tuesday, December 16, 2014 9:21 AM
To: 'huff@ecohealthalliance.org <mailto:huff@ecohealthalliance.org>'
Cc: (b)(6)
Subject: RE: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Dr. Huff,

Good Morning, my name is (b)(6) and I have been assigned your requirement. I will be familiarizing myself with this requirement as well as developing negotiation objectives for the pricing you have proposed. As soon as I have a better understanding of where this process was left upon (b)(6) departure, I will be back in touch with any questions or concerns I have. In the meantime, please don't hesitate to contact me with any questions or concerns of your own!

Respectfully,

(b)(6) Contractor Support
Sr. Contract Specialist
JAB Solutions, LLC

Phone: (b)(6)
Email:

-----Original Message-----
From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Monday, December 15, 2014 2:13 PM
To: (b)(6)
Cc: (b)(6) Harvey Kasdan; Peter Daszak; William B. Karesh; Aleksei Chmura
Subject: Re: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Thank you (b)(6) for all of your help! I am looking forward to the conversation with your contract specialist.

Best,

Andrew

--

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist

EcoHealth Alliance <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/>
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4497 (direct)
(b)(6) (mobile)
1.212.380.4465 (fax)

(b)(6)

December 15, 2014 at 1:57 PM
Andrew,

That is correct - in light of (b)(6) departure, my team will be now filling in for the ultimate negotiation of your contract. I am in the process of getting a Contract Specialist from my team assigned to pick up where (b)(6) had left off, which I hope to have finalized by tomorrow, when our Branch Chief returns to the office.

Regarding the award date of the contract, my recommendation for the sake of expectations management would be to plan for the potential for a gap in funding. Whomever is assigned as the new Contract Specialist will need to get up to speed as to where (b)(6) had left off, and the holidays being immediately upon us won't help. Most importantly, however, please understand that this proposal and ultimate contract is completely independent of any other existing contract.

I'll have the new Contract Specialist contact you asap (again, tomorrow, most likely) to introduce himself/herself as he/she begins to get acquainted with the current status of the award process.

Thanks,

(b)(6)

Contracting Officer
Contracts - Research & Development Division (J4CRC)
Defense Threat Reduction Agency
(b)(6)

-----Original Message-----
From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Monday, December 15, 2014 1:24 PM
To: (b)(6)
Cc: (b)(6) Harvey Kasdan; Peter Daszak; William B. Karesh; Aleksei Chmura
Subject: Re: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Thank you Vic! Your assistance is greatly appreciated!

H (b)(6)

I have been having difficulty getting in touch with the contracting officer that we were working with at DTRA (b)(6) This past week at the International Society for Disease Surveillance Annual Conference, I had lunch with (b)(6) DTRA) and was informed that the contracting officer that was responsible for our GRITS 2 proposal/SOW/contract ((b)(6) has left DTRA.

This morning, (b)(6) informed me that I should follow-up Vic to ensure that everything is on track. In turn, Vic has referred me to you.

Here are a few key facts and things that we need to follow-up on:

* Our current contract for GRITS 1 expires in roughly 45 days;

* We sent the revised SOW to DTRA (b)(6) roughly 2 months ago; and,
* We have not received any feedback from him or DTRA since we sent the revised documents to him.

I want to ensure that there are no gaps in our funding and ensure that there are not any delays in the development and advancement of the technologies that we are developing for DTRA.

Please let me know how I can help you get the process get moving again.

Best,

Andrew

Dr. Andrew Huff <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org>
December 15, 2014 at 1:24 PM
Thank you Vic! Your assistance is greatly appreciated!

Hi (b)(6)

I have been having difficulty getting in touch with the contracting officer that we were working with at DTRA (b)(6) This past week at the International Society for Disease Surveillance Annual Conference, I had lunch with (b)(6) (DTRA) and was informed that the contracting officer that was responsible for our GRITS 2 proposal/SOW/contract (b)(6) has left DTRA.

This morning, (b)(6) informed me that I should follow-up Vic to ensure that everything is on track. In turn, Vic has referred me to you.

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* We have not received any feedback from him or DTRA since we sent the revised documents to him.

I want to ensure that there are no gaps in our funding and ensure that there are not any delays in the development and advancement of the technologies that we are developing for DTRA.

Please let me know how I can help you get the process get moving again.

Best,

Andrew

--

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist

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460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4497 (direct)
(b)(6) (mobile)
1.212.380.4465 (fax)

(b)(6)

December 15, 2014 at 1:07 PM
Good Afternoon Dr. Huff,

The specialist (b)(6) has left DTRA. Your contract action has been transferred to (b)(6) (b)(6) who is working on assigning your action to one of his specialist. I apologize for the confusion but I will need to refer you to (b)(6) on future communication.

Respectfully,

(b)(6)
Lead Contracting Officer
DTRA/J4CRC
Con(b)(6)
DSN
Cell
Fax
(b)(6)

-----Original Message-----
From: Dr. Andrew Huff [mailto:huff@ecohealthalliance.org]
Sent: Monday, December 15, 2014 11:41 AM
To: (b)(6)
Cc: (b)(6), Harvey Kasdan; Peter Daszak; William B. Karesh; Aleksei Chmura
Subject: Response Requested: EcoHealth Alliance - GRITS 2.0 - proposal, SOW, & award finalization

Dear (b)(6)

I have been having difficulty getting in touch with the contracting officer that we were working with at DTRA ((b)(6)). This past week at the International Society for Disease Surveillance Annual Conference, I had lunch with (b)(6) (DTRA) and was informed that the contracting officer that was in responsible our GRITS 2 proposal/SOW/contract (b)(6) has left DTRA.

This morning, (b)(6) informed me that I should follow-up with you to ensure that everything is on track.

Here are a few key facts and things that we need to follow-up on:

* Our current contract for GRITS 1 expires in roughly 45 days;

* We sent the revised SOW to DTRA ((b)(6)) roughly 2 months ago; and,
* We have not received any feedback from him or DTRA since we sent the revised documents to him.

I want to ensure that there are no gaps in our funding and ensure that there are not any delays in the development and advancement of the technologies that we are developing for DTRA.

Please let me know how I can help you get the process get moving again.

Best,

Andrew

Dr. Andrew Huff <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org> <mailto:huff@ecohealthalliance.org>
December 15, 2014 at 11:41 AM
Dear (b)(6)

I have been having difficulty getting in touch with the contracting officer that we were working with at DTRA ((b)(6)). This past week at the International Society for Disease Surveillance Annual Conference, I had lunch with (b)(6) (DTRA) and was informed that the contracting officer that was in responsible our GRITS 2 proposal/SOW/contract (b)(6) has left DTRA.

This morning, (b)(6) informed me that I should follow-up with you to ensure that everything is on track.

Here are a few key facts and things that we need to follow-up on:

* Our current contract for GRITS 1 expires in roughly 45 days;

* We sent the revised SOW to DTRA (b)(6) roughly 2 months ago; and,
* We have not received any feedback from him or DTRA since we sent the revised documents to him.

I want to ensure that there are no gaps in our funding and ensure that there are not any delays in the development and advancement of the technologies that we are developing for DTRA.

Please let me know how I can help you get the process get moving again.

Best,

Andrew

--

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist

EcoHealth Alliance <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/> <http://www.ecohealthalliance.org/>
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4497 (direct)
(b)(6) (mobile)
1.212.380.4465 (fax)

--

Andrew G. Huff, Ph.D., M.S.
Senior Research Scientist

EcoHealth Alliance <http://www.ecohealthalliance.org/>
460 West 34th Street – 17th floor

New York, NY 10001

1.212.380.4497 (direct)
(b)(6) (mobile)
1.212.380.4465 (fax)

(b)(6)

From: Karissa Whiting <whiting@ecohealthalliance.org>
Sent: Friday, November 04, 2016 1:24 PM
To: (b)(6)
Cc: Joe Riccardi
Subject: Fwd: [Non-DoD Source] EcoHealth Alliance DTRA invoicing

---

H(b)(6)

DCAA has let us know that they cannot process our invoices from now on, because they only process invoices for DoD contractors that they also perform audits of incurred cost. This was surprising, as we have been invoicing through DCAA for a few years now.

Annually, we send our audits to HHS who approves our rates. We contacted HHS who said we should contact DoD for assistance with this.

Do you know how we can resolve this, or could you please provide a contact of someone who can help us with this?

Thanks in advance!
Karissa

---------- Forwarded message ----------
From: Callerame, Al, Mr, DCAA <Al.Callerame@dcaa.mil < Caution-mailto:Al.Callerame@dcaa.mil > >
Date: Tue, Nov 1, 2016 at 12:59 PM
Subject: RE: [Non-DoD Source] EcoHealth Alliance DTRA invoicing
To: Joe Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > >

Joe,

As discussed a few weeks back, my management has directed me not to process any more public vouchers from EcoHealth Alliance. Typically, we process vouchers for those DoD contractors that we also perform audits of incurred cost. Therefore, since DCAA is not the cognizant audit agency, we should not continue processing vouchers.

Any questions, please contact me.

Al Callerame
DCAA - Greater Connecticut Branch
New York Suboffice

201 Varick Street - Room 615
New York, NY 10014
(212) 620-6373 < tel:%28212%29%20620-6373 >
Email: al.callerame@dcaa.mil < Caution-mailto:al.callerame@dcaa.mil >

-----Original Message-----
From: Joe Riccardi [Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org >]
Sent: Tuesday, November 01, 2016 11:02 AM
To: Callerame, Al, Mr, DCAA
Subject: [Non-DoD Source] EcoHealth Alliance DTRA invoicing

Good Morning Al,

We had spoken a few weeks ago about not submitting our invoices directly anymore and that HHS needed to provide us with a new location.

Could you please put this in an e-mail so I can provide this to the CFO and President.

Thanks

Joe

--

Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4494 < tel:1.212.380.4494 > (direct)

(b)(6) (mobile)

1.212.380.4465 < tel:1.212.380.4465 > (fax)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > <Caution-http://www.ecohealthalliance.org/ < Caution-http://www.ecohealthalliance.org/ > >

EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics..

--

Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics..

--

Karissa Whiting

Research Assistant

EcoHealth Alliance < Caution-http://www.ecohealthalliance.org >
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4476 < tel:1.212.380.4476 > (direct)
(b)(6) (mobile)
1.212.380.4465 < tel:1.212.380.4465 > (fax)

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

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(b)(6)

From: (b)(6)
Sent: Thursday, November 10, 2016 12:57 PM
To: 'ONR_Boston@navy.mil'
Cc: 'Karissa Whiting'; 'Vasken.Kolancian@dcma.mil'
Subject: HDTRA1-15-C-0041 EcoHealth Alliance Transfer of Administration from DCMA to ONR
Attachments: HDTRA-15-C-0041-FINAL-ATTACHMENTS.pdf; HDTRA1-15-C-0041-P00001.pdf; HDTRA1-15-C-0041 Mod P00002 signed.pdf; HDTRA1-15-C-0041-P00003 Fully Executed.pdf

Hello,

EcoHealth Alliance, a non-profit company was originally assigned to DCMA for contract administration. Recently DCAA made a determination that they would no longer process EcoHealth invoices, since DCAA is not the auditing agency for EcoHealth.

Modification P00003 transferred the administration assignment from DCMA to ONR - Boston, in order to allow for ONR to work with EcoHealth's auditing agency, HHS.

For your convenience, I'm attaching the Award, Mods P00001, P00002 and P00003 for your files.

Please let me know if you have any questions or need anything further with regard to keeping EcoHealth's invoice payments moving forward.

If you need to contact EcoHealth directly, please check with Karissa Whiting and she will be able to point you in the right direction. Her phone is 212-380-4476, and her email address is whiting@ecohealthalliance.org.

Thank you,

(b)(6)
Senior Contract Specialist (Contractor)
Contracts - Research & Development Division (J4CRC) Defense Threat Reduction Agency
Phone (b)(6)
Email:
Notice: This contractor support employee is acting in an advisory role only and has no authority to bind the government in any way.

From: Karissa Whiting
To: (b)(6)
Cc: Andrew Huff; Zachary Gold
Subject: Updated Cost Proposals
Date: Monday, February 9, 2015 5:23:28 PM
Attachments: EHA-COST SUMMARY-02092015-FINAL (2).xlsx
Kitware- COST BREAKOUT_02092015 (3).xlsx
Epidemico - COST BREAKOUT_02092016.xlsx

Hi (b)(6)

I have attached updated cost proposals for Kitware, Epidemico and EHA.

The Kitware cost proposal takes into account the extra trip that was missing on the previous version. Airfare and train costs are both correctly indicated to allow trips from North Carolina and Clifton Park (Kitware's two locations).

The Epidemico cost proposal has the updated indirect cost rates taken from their 2015 rate card previously sent. In regards to the HealthMap license fee ($10,000) I have no further updates on justifications other than what I sent you from Epidemico at the end of last week. If this is not sufficient, let me know if there is anything else EHA can provide you, or we can remove this all together.

The updated EHA cost proposal should reflect these updated subcontractor costs. Please let me know if you have any questions or need anything else from us. Thank you!

Best,
-Karissa

--

Karissa Whiting

Program Assistant

EcoHealth Alliance <http://www.ecohealthalliance.org>
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4475 (direct)
(b)(6) mobile)
1.212.380.4465 (fax)

www.ecohealthalliance.org <http://www.ecohealthalliance.org/>

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COST SUMMARY

	Base Case			Option 1			Option 2			Option 3			Option 4		
Cost Center	Rate / Hrs	Quantity / Hrs	Total Amount	Rate / Hrs	Quantity / Hrs	Total Amount	Rate / Hrs	Quantity / Hrs	Total Amount	Rate / Hrs	Quantity / Hrs	Total Amount	Rate / Hrs	Quantity / Hrs	Total Amount
Senior Research Scientist	$ 87.50	2080	$ 182,000	$ 350.00	2080	$ 728,000	$	XX	$	$	XX	$	$	XX	$
Senior Software Developer III	$ 72.00	2080	$ 149,760	$ 288.00	2080	$ 599,040	$	XX	$	$	XX	$	$	XX	$
Senior Data Scientist III	$ 72.00	2080	$ 149,760	$ 288.00	2080	$ 599,040	$	XX	$	$	XX	$	$	XX	$
Postdoctoral Fellow	$ 37.50	1,248	$ 46,800	$ 150.00	1,248	$ 187,200	$	XX	$	$	XX	$	$	XX	$
Research Scientist II	$ 47.00	2080	$ 97,760	$ 188.00	2080	$ 391,040	$	XX	$	$	XX	$	$	XX	$
Research Assistant	$ 25.00	1,248	$ 31,200	$ 100.00	1,248	$ 124,800	$	XX	$	$	XX	$	$	XX	$
Research Assistant	$ 25.00	1,248	$ 31,200	$ 100.00	1,248	$ 124,800	$	XX	$	$	XX	$	$	XX	$
Senior Software Developer III	$ 72.00	2080	$ 149,760	$ 288.00	2080	$ 599,040	$	XX	$	$	XX	$	$	XX	$
Program Assistant III	$ 21.00	2080	$ 43,680	$ 42.00	2080	$ 87,360	$								
Software Developer III	$ 55.00	2080	$ 114,400	$ 110.00	2080	$ 228,800	$	XX	$	$	XX	$	$	XX	$
Software Developer III	$ 55.00	2080	$ 114,400	$ 110.00	2080	$ 228,800	$	XX	$	$	XX	$	$	XX	$
TOTAL DIRECT LABOR		XX	$ 856,960		XX	$ 2,952,960	$	XX	$		XX	$		XX	$
LABOR BURDEN	Rate	Burden Applied To	Total Amount	Rate	Burden Applied To	Total Amount	Rate	Burden Applied To	Total Amount	Rate	Burden Applied To	Total Amount	Rate	Burden Applied To	Total Amount
FRINGE BENEFITS	30.00%	$ 856,960.00	$ 257,088.00	30.00%	$ 2,952,960.00	$ 885,888	%	$	$ XX	%	$	$	%	$	$
OVERHEAD			$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL LABOR BURDEN			$ 1,457,048.00			$ 1,777,476.00			$			$			$
EQUIPMENT			$ 21,000.00			$			$			$			$
TRAVEL			$ 5,000.00			$ 15,000.00			$			$			$
ANIMALS			$ 30,000.00			$ 120,000.00			$			$			$
MATERIALS & SUPPLIES			$ 1,284,165.47			$ 1,281,320.63			$			$			$
TOTAL DIRECT COSTS			$ 2,613,213.47			$ 2,993,796.63			$			$			$
FACILITIES & ADMIN	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount
FACILITIES	45.00%	$ 856,960.00	$ 385,632.00	45.00%	$ 2,952,960.00	$ 1,328,832	%	$	$	%	$	$	%	$	$
EQUIPMENT & VEHICLE COSTS (EXCLUDING EQUIPMENT Direct Charged to Grant Items)			$			$			$			$			$
TOTAL COSTS			$ 3,021,293.47			$ 3,079,203.79			$			$			$
FEE PROFIT	Fee Rate	Fee Rate Applied to Total Direct Costs (Excluding Travel & Equipment)	Total Amount	Fee Rate	Fee Rate Applied to Total Direct Costs (Excluding Travel & Equipment)	Total Amount	Fee Rate	Fee Rate Applied to Total Direct Costs (Excluding Travel & Equipment)	Total Amount	Fee Rate	Fee Rate Applied to Total Direct Costs (Excluding Travel & Equipment)	Total Amount	Fee Rate	Fee Rate Applied to Total Direct Costs (Excluding Travel & Equipment)	Total Amount
FEE OR PROFIT	%	$	$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$ 3,021,293.47			$ 3,079,203.79			$			$			$

MATERIALS/EQUIPMENT

Lot	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Product Found	Technical Information
Premium	Apple	Black Mx Band Pro	$5499.99	6	$32994.00	Best Buy	Discount price apple smart watch 49mm titanium case with black ocean band mx band pro 1570753
Standard	Apple	Thunderbolt Digital	$333.11	3	$999.00	Best Buy	Discount price apple computers - new apple 27-inch imac 5k pro - mx9d4ll/a - apple 27-inch imac 5k pro - mx9d4ll/a
					$21.95		

Note
Premium tiers may be Tesla's actual numbers and for individual items over $5,000. For those items that are not $5,000, I've separately found the retail price and the price tag.

TRAVEL

Trip #:	1	Location:	Boston, MA (HealthMap and ProMED-mail)	Contract Period
Purpose:	Meet with HealthMap and ProMED-mail editors			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$800.00	$284.00	$1,000.00	$240.00	$2,324.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Boston	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	2	Location:	Carrboro, NC (Kitware)	Contract Period
Purpose:	Meet with Kitware database team			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$224.00	$500.00	$240.00	$1,964.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Carrboro	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	3	Location:	Clifton Park, NY (Kitware)	Contract Period
Purpose:	Meet with Kitware visualization team			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2		$224.00	$500.00	$720.00	$1,444.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$400.00
Transportation in Clifton Park/Albany	$120.00
Local transport NYC	$200.00
Total:	$720.00

Trip #:	4	Location:	Washington, DC Area (DTRA and BSVE)	Contract Period
Purpose:	Meet with DTRA and the BSVE team			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$284.00	$1,000.00	$320.00	$2,604.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	5	Location:	Washington, DC Area (DTRA and BSVE)	Contract Period
Purpose:	Meet with DTRA and the BSVE team			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$1,000.00	$320.00	$2,104.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	6	Location:	TBD (Digital Disease Detection Conference)	Contract Period
Purpose:	Attend Digital Disease Detection Conference hosted by HealthMap			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
4	2	$1,000.00	$568.00	$3,000.00	$320.00	$4,888.00

Itemized Expenses for "Other"

Description	Amount
nsportation to/from airport and during confer	$120.00
Local transport NYC	$200.00

		Total:	$320.00

OTHER DIRECT COSTS

Description	Estimated Price	Frequency Period	Assumptions/Information
			Individual access to and/or additional information may be required for this equipment and the estimated cost was calculated. Excerpts from Investigational laboratory assays required to complete Task 4 and are calculated at a rate of $200 per hour. Laboratory human research participants with physical collection and storage
Cloud Processing Storage	$2,700,000	Base Period	Commercial cloud processing and storage, International American development and processing Laboratories Supplement per year ($125/hour, 2,115 x 12 months); assuming an average daily General image count
Domain Registration	$ 60,000	Base Period	Annual registration and renewal costs associated
Encode API Subscription	$9,000	Base Period	Cost of Google API access and data hosting ($0.20 per 1k characters) for geographic work with multiple languages
Data Processing	$2,400,000	Base Period	Assumes global datasets will be purchased. Used in primary diseases and regions identified in consultation with DARA GIZ
Code Hosting	$240,000	Base Period	Estimated cost of GitHub Enterprise Cloud platform plan
Books and Reference Materials	$5,000	Base Period	Estimate assumes Samples of Natural Products additional books, references, and
Services Licenses	$ 150,000	Base Period	Assumes hosting services and related fees, tests, and all NDC personnel
Publication Fees	$120,000	Base Period	Combined Based on average publication fee (Plos) Public Library of Science Journals ($2,500 per publication
Website Costs	$50,000	Base Period	Typically specific affiliations or the journals at the best health Values of the NY Flowers painting, capping, and sound support for the implementation, and beyond supplies, and other
	$10,790,000		
Cloud Processing Storage	$ 2,700,000	Option Year 1	Commercial cloud processing and storage, International American development and processing Laboratories Supplement per year ($125/hour, 2,115 x 12 months); assuming an average daily General image count
Domain Registration	$ 60,000	Option Year 1	Annual registration and renewal costs associated
Encode API Subscription	$9,000	Option Year 1	Cost of Google API access and data hosting ($0.20 per 1k characters) for geographic work with multiple languages
Data Processing	$2,400,000	Option Year 1	Assumes global datasets will be purchased. Used in primary diseases and regions identified in consultation with DARA GIZ
Code Hosting	$240,000	Option Year 1	Estimated cost of GitHub Enterprise Cloud platform plan
Books and Reference Materials	$5,000	Option Year 1	Estimate assumes Samples of Natural Products additional books, references, and
Services Licenses	$ 150,000	Option Year 1	Assumes hosting services and related fees, tests, and all NDC personnel
Publication Fees	$120,000	Option Year 1	Combined Based on average publication fee (Plos) Public Library of Science Journals ($2,500 per publication
Website Costs	$50,000	Option Year 1	Typically specific affiliations or the journals at the best health Values of the NY Flowers painting, capping, and sound support for the implementation, and beyond supplies, and other
	$10,790,000		

SUBCONTRACTORS

Company Name	Total Price	Contract Period	Additional Information
Kitware	$506,686.72	Base Period	
Epidemico	$612,937.76	Base Period	
ISID	$124,521.99	Base Period	
Kitware	$521,887.33	Option I	
Epidemico	$630,875.90	Option I	
ISID	$128,257.65	Option I	

COST SUMMARY

	Base Period			Option I								
Cost Element	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount
Labor Category & Title							\	XX	\	\	XX	\
Dr. Barnes	$46.27	835.79	$21,777.86	$49.67	835.79	$41,481.05	\	XX	\	\	XX	\
Patrick Reynolds	44.51	835.79	$37,432.86	$46.45	835.79	$38,827.61	\	XX	\	\	XX	\
R&D Engineer	44.51	1,182.22	$52,632.17	$45.62	1,182.22	$53,955.69	$	XX	$	$	XX	$
R&D Engineer	44.51	1,182.22	$52,632.17	$45.62	1,182.22	$53,955.69	\	XX	\	\	XX	\
							\	XX	\	\	XX	\
TOTAL DIRECT LABOR		4034.82	$182,466.06		4034.82	$187,943.04		XX	\		XX	\
LABOR BURDEN	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount
FRINGE BENEFITS	%	\	\	%	\	\	%	\	\	%	\	\
OVERHEAD	%	\	\	%	\	\	%	\	\	%	\	\
TOTAL LABOR BURDEN			$182,466.06			$187,943.04			\			\
TOTAL EQUIPMENT			$0.00			$0.00			$			$
TOTAL TRAVEL COSTS			$4,832.00			$4,976.96			\			\
TOTAL ALL OTHER DIRECT COSTS			$0.00			$0.00			\			\
TOTAL SUBCONTRACTOR COSTS			$0.00			$0.00			$			$
TOTAL DIRECT COSTS			$187,298.06			$192,919.00			\			\
G&A, F&A, FCCM	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount
Indirect Costs	82.80%	$187,298.06	$155,052.80	82.80%	$192,919.00	$159,735.25	%	\	\	%	\	\
G&A	34.00%	$342,350.86	$116,479.29	34.00%	$353,652.28	$120,241.85	%	\	\	%	\	\
FACILITIES CAPITAL COST OF MONEY (FCCOM) (Attach Completed DD Form 1861)			\			\			\			\
TOTAL COSTS			$473,830.15			$488,896.76			\			\
FEE/PROFIT	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount
FEE OR PROFIT	7.00%	$464,032.15	$32,482.25	7.00%	$483,103.50	$33,817.25	%	\	\	%	\	\
TOTAL COST PLUS FEE			$506,680.72			$521,887.35			$			$

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$532.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	2		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$532.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	3		Location:	Washington, DC Area (DTRA and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
2	2		$420.00	$284.00	$354.00	$120.00		$1,178.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:	4		Location:	Washington, DC Area (DTRA and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
$2.00	$2.00		$420.00	$284.00	$354.00	$120.00		$1,178.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

	Base Period			Option I								
Cost Element	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount
Labor Category & Title							$	XX	$	$	XX	$
Dr. . Bownsle n	$77.26	710	$54,847.50	$79.57	710	$56,492.93	$	XX	$	$	XX	$
Clark Freifeld , Senior Software Programmer	65.00	710	$39,050.00	$66.95	710	$40,221.50	$	XX	$	$	XX	$
Hanoic Rodriguez Software Programmer	37.55	1710	$64,210.50	$38.68	1710	$66,136.82	$	XX	$	$	XX	$
Kate O Brien, Front-end Software Developer	32.19	1610	$51,825.90	$33.16	1610	$53,380.68						
Chi Rahn, Project Manager	28.51	1715	$50,009.65	$29.46	1715	$52,127.64						
Carrie Preece, Data Curator	28.51	1710	$50,462.10	$29.46	1710	$51,975.66	$	XX	$	$	XX	$
TOTAL DIRECT LABOR		8165	$311,005.65		8165	$320,335.82		XX	$		XX	$
LABOR BURDEN	Rate	Rate Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount
FRINGE BENEFITS	0.27	$311,005.65	$83,971.53	0.27	$320,335.82	$86,490.67	%	$	$	%	$	$
TOTAL LABOR BURDEN			$394,977.18			$ 406,826.49			$			$
TOTAL MATERIEL/EQUIPMENT			$0.00			$0.00			$			$
TOTAL TRAVEL COSTS			$3,646.00			$3,757.44			$			$
TOTAL ALL OTHER DIRECT COSTS			$10,000.00			10000			$			$
TOTAL SUBCONTRACTOR COSTS			$0.00			0			$			$
TOTAL DIRECT COSTS			$408,625.18			$420,583.93			$			$
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A AND OVERHEAD	0.5	$408,625.18	$204,312.59	$0.50	$420,583.93	$210,291.97	%	$	$	%	$	$
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$			$			$			$
TOTAL COSTS			$612,937.76			$630,875.90			$			$
FEE/PROFIT	Fee Rate	Fee Rate Applied to (total cost excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount
FEE OR PROFIT	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$			$			$			$

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (GeoHealth Trip)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$300.00	$284.00	$600.00	$240.00	$1,824.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and HSVI)		Contract Period	
Purpose:	Meet with DTRA and the BSVI team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$300.00	$284.00	$600.00	$240.00	$1,824.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$300.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
						$0.00	

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
HealthMap License Fee	$10,000	Base Period	HealthMap data license fee
HealthMap License Fee	$10,000	Option Year 1	HealthMap data license fee

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

Volume I: Technical Proposal

I. Abstract

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We aim to enhance our current GRITS platform, developed with DTRA support, by scaling this system to handle large data volumes in near-real-time, enhancing diagnostic capabilities through network and cluster analysis, and improving visualization through use of the latest reactive web technologies. GRITS will also utilize the benefits and explore the integration of crowdsourcing, collective intelligence, and expert review. This tool will rely on automation to ingest media, extract key disease characteristics, and recommend resources, increasing the specificity of the data feed to an analyst's workflow. We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose and to connect with experts from ProMED, HealthMap and EcoHealth, thereby increasing our network of experts from digital surveillance and open source communities. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats, advancing our readiness to combat the broad class of chemical and biological threats posed by EIDs.

Keywords
disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, real-time, data science

II. Scope

A. Objective

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

B. Background

The discovery of HIV/AIDS in the 1980s marked the transition from declaring victory over infectious diseases, to global increases in disease emergence and re-emergence[1]. EcoHealth Alliance (EHA) is at the forefront of organizations working to 'get ahead of the epidemic curve' by identifying these threats before the next pandemic or extinction event. Our researchers pioneered the identification of the origins of pathogens, such as Nipah virus[2], SARS[3], and MERS[4]. We constantly seek innovative approaches to target our field surveillance efforts on emerging threats[5]. To this end, the global increase in the volume of data, from the growth of the web and instrumented systems, presents both a challenge to traditional surveillance approaches and a tremendous opportunity for novel discoveries.

Various biosurveillance technologies have been developed to monitor Internet data sources, for instance, syndromic surveillance initiatives target surrogate indicators of a disease outbreak[6]. As with other sectors, such as commerce, marketing, and finance, the challenge is to manage the

expanding volume of data while identifying signals of interest[7]. In the case of EIDs, access to emergent media, including participatory, personal, and interactive media, characterized by decentralized content generation (e.g. the blogosphere, internationalization, and social media), presents an opportunity to detect early mentions of disease characteristics and anomalies of interest.

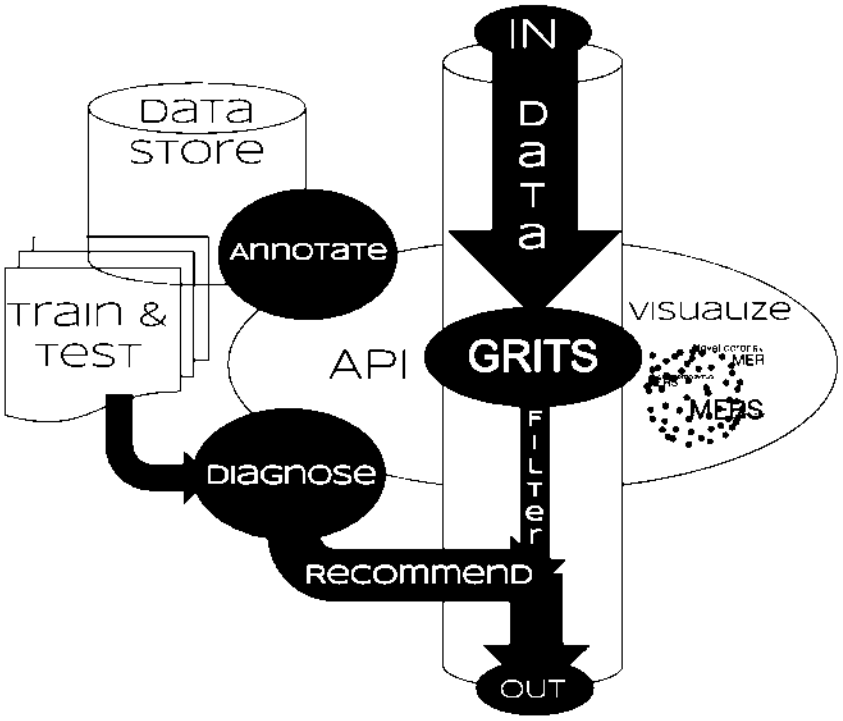
The GRITS partners are among the leading organizations in this domain. ProMED-mail (International Society of Infectious Diseases) manages a global email network of clinicians who are often among the first to identify and report disease threats[8]. Epidemico (HealthMap)[9] actively curates an expanding catalog of relevant news and social media assets. Both organizations are unique among their peers in leveraging broad networks of experts to curate and reduce the volume of media to a high-quality feed. Kitware Inc., our technical partner, has engineered sustainable communities around successful, high-impact open source scientific software.

EcoHealth assembled the GRITS team to advance the state-of-the-art in the detection and diagnosis of disease threats. GRITS combines new technologies with expert networks to apply the sciences of disease ecology and epidemiology to diagnosing big data for near-real-time disease situation awareness. We built GRITS upon pre-existing communities of expertise, rather than *de novo* technical solutions, recognizing that human experts must be integrated into the platform to ensure its intelligence and growth. In addition, we sought novel mechanisms for decision support by organizing, prioritizing, contextualizing, and linking information to relevant current and historic resources. Overall, we deploy science at the core of our systems to assemble near-real-time information in a manner that supports decision makers with diagnostic tools built by, and for, the digital disease ecology community. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats.

Description of GRITS Capabilities

We take a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS ingests and processes data feeds to provide decision support to analysts, with the following capabilities:

Diagnose - Identify the disease(s) described in a resource. Return a ranked list of disease with quantitative metrics of certainty (differential diagnoses).
Mine - Extract the key components of document via automated analysis, collective annotation, and expert curation. Return a set of relevant information.
Recommend - Expand the materials available to the analyst. Return a collection of recommended resources that provide historic and contemporary context.
Filter - Reduce the complexity of the data feed by selecting those documents that meet diagnostic criteria of interest to the analyst. Return a filtered subset of data.
Connect - Relate the material to underlying ontologies to provide a decision framework for the analyst. Return connections to other bioevents based on underlying network structures (e.g. geography, ecology, time, host, pathogen, and environmental drivers).



Sources of GRITS biointelligence

A. Machine	Data mining, machine learning, and natural language processing
B. Expert	Elicitation, consultation, and peer review
C. Collective	Crowdsourcing annotation and human intelligence tasks

A. Machine

GRITS leverages automation to ingest, process, and return an initial diagnosis of digital media, reducing the extraneous sources of information through which experts and reviewers must sort. The GRITS text mining system extracts key disease characteristics, such as locations, case counts, and dates, for our metadata and diagnostic models. These features, which may be combined into composite features by high level rules, are based on sentence patterns and keywords chosen from third-party sources such as WordNet, Geonames, Disease Ontology, Symptom Ontology, and Biocaster Ontology. The categories we extract, such as hosts, pathogens, diseases, signs and symptoms, drivers, and transmission types, are also informed by historic disease event data curated via our GRID project, and prioritized through consultation with our experts. The GRITS diagnostic models, that use machine learning algorithms based on extracted keywords to classify articles, are trained on test articles labeled with diseases by our partners. A key function of this machine intelligence is to provide the materials and platforms to crowdsource the training data.

B. Expert

GRITS is designed to be tightly integrated with a broad network of experts who contribute

relevant domain expertise ranging from disease ecology, wildlife health, epidemiology, biosurveillance, and medicine. We propose to enhance the accuracy of text mining service through expert consultation and close integration with public ontologies maintained by expert communities. We currently rely on experts to curate our content; however, we hope to close the loop by allowing BSVE users to contact these expert communities for input, including diagnostic advice, regional expertise, and language support (GRITS.net).

To fully integrate our users, we propose extending GRITS to provide more insight and flexibility in its operation. We wish to create mechanisms to edit and examine the effects of keywords on diagnosis, customize extracted features, and provide feedback on the 'best' diagnosis, thereby iteratively generating training data for the diagnostic algorithms. We also intend to test the article representations we use for classification through game-based mechanisms to identify areas for improvement in our representations. By combining a rule-based system with an algorithmic approach, the platform maintains both greater potential for expert input and easy interpretation for non-technical users.

C. Collective

The machine learning component of GRITS requires training data from portfolios of articles with disease labels and disease characteristic metadata, information collected from HealthMap and ProMed editors in order to highlight and categorize important features and relationships. These are then used to train classifiers to identify specific features of importance. To extend the range of articles we can classify, we propose using crowdsourcing methods via Amazon's Mechanical Turk and Zooniverse to generate labels and annotations for articles that do not require domain expertise.

To further enhance the accuracy of the GRITS classification algorithms, we propose crowdsourcing a diagnostic challenge, whereby we host and share our training data on an existing challenge platform (e.g. Kaggle), where programmers compete to build classifiers to improve accuracy.These approaches would compliment the models developed by our internal users and promote global citizenship in combating the scourge of emerging infectious disease. Finally, we propose integrating EHA's Global Repository for Infectious Diseases (GRID) to solicit collective intelligence and peer editing to develop a canonical collection of event data portfolios for BSVE users and the broader scientific community. The BSVE will have access to the GRID API throughout the contract period with an option to continue access through continued funding. EHA will also provide a copy of the GRID data to DTRA at the end of the contract period.

Our three-pronged approach (machine, expert, and collective) is a unique strength of the GRITS platform. Experts contribute keywords and rules to improve automated text mining tools, identify human intelligence tasks, and prioritize areas for algorithm development. Meanwhile, the automated tools enable experts to make the best use of their time by farming out less specialized tasks to the crowd, identifying errors in the data sources, and notifying editors or creating tasks to crowdsource solutions. In the case that there isn't enough data to deliver an accurate diagnosis, GRITS will identify the most useful information in distinguishing disease candidates and recommend an expert or field team to consult from our network (GRITS.net). Combined, this presents a unique conceptual model and workflow for supporting outbreak investigation.

Proposed Development

GRITS enhances traditional search with adaptive diagnostic models, trained on a broad spectrum of resources from GRITS partners and curated by our communities of experts. This diagnostic function reduces the complexity and increases the specificity of the data feed to an analyst's workflow. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. To ensure rapid diagnosis when a disease first emerges, GRITS blends social media, news media, and scientific literature. This approach may be further leveraged to identify unusual events and diagnostic gaps that may herald an emerging infectious disease of unknown etiology.

BSVE integration and benefits

We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards for decision support via additional visualizations and diagnostic tools.
The GRITS interface in BSVE will connect users to experts from ProMED, HealthMap and EcoHealth. The data processing stack will provide the capabilities identified above (diagnose, mine, recommend, filter, and connect) to data being ingested or monitored by the BSVE. Our diagnostic service is designed to continually evolve and improve via mechanisms for input from collective, expert, and machine intelligence sources. Our novel approach to diagnostics builds upon traditional search with the infusion of disease ecology into the methodology.

Technical Challenges

Due to incomplete reporting, errant diagnoses, delayed onset of symptoms, and delays in laboratory results, it is difficult diagnose diseases in the early phase of an outbreak[10]. Dialect varies among data sources and there is high variability in accessibility of news sources and scientific literature. Software has a language bias where non-latin characters are often the source of bugs, and foreign language articles require translation to fit into a single NLP pipeline. Additionally, media attention is biased toward OECD countries, with blind spots in some of the locations where diseases more frequently emerge, particularly those with limited clinical infrastructure and access to health professionals[11]. However, as a shared and accessible platform that can maximize the utility of both expert networks and machine intelligence, our tool is of particular value in resource-poor areas without laboratory diagnostic facilities or, with past events, where clinical samples are no longer available. To reduce the time-lag in detecting EIDs, we are interested in identifying prompt data sources and recruiting members of the GRITS network and BSVE community in disease prone environments to provide additional reports of emerging diseases.

When attempting to respond to user submitted corrections and feedback, some classifiers take considerable time to train (e.g. neural nets), and completely retaining any classifier on big data can be prohibitive. We will need to investigate methods of incrementally retraining our classifier in a timely manner as new data is submitted.

Technical merit

Overall, we propose to expand our automated data extraction to support reporting initiatives and event notification systems with near-real-time automated extraction of disease-relevant information from an arbitrary, unstructured data feed. Further development of the GRITS text mining system will allow us to introduce ecological and epidemiological concepts to extract more

complex information such as host-pathogen relationships and quantitative data (e.g. case counts) for modeling and analysis[12]. We want to improve the precision of the features we extract by developing more sophisticated natural language processing pipelines. Additionally, we plan to reduce error rates by taking advantage of the open source NLP software ecosystem to perform word sense disambiguation and coreference resolution. Identifying the features GRITS and BSVE users value and providing channels for them to provide us with feedback will also be important to improving GRITS. We propose dynamically retraining the classification algorithm GRITS uses to diagnose diseases based on user submitted corrections to its diagnosis. Finally, we plan on open sourcing reusable components of our system so that other groups can benefit from our work.

Our technology stack consists of modern web technologies such as Meteor that allow us to seamlessly update the content of the UI in near-real-time. These frameworks are compatible with the current technologies in the BSVE, such as AngularJS. We are actively investigating distributed processing technologies, such as Storm, that would allow us to process large volumes articles in parallel. Furthermore, we employ implementations of machine learning algorithms from scikit-learn, and are using natural language processing algorithms (e.g. tokenizing, part-of-speech-tagging, lemmatization) from nltk, and CLIPS pattern. We have started with a Python ML/NLP stack because of the rich software ecosystem available, and the ability to prototype rapidly with IPython notebooks.

Scientific merit

Automated categorization of EID reports by the GRITS diagnostic classifier will enable analysts and to search and filter them, increasing the ratio of relevant information they review. Furthermore, GRITS will provide decision support by suggesting potential diseases in reports of unknown diseases, and by recommending relevant data to review and organizations to contact. An established networks of experts from EcoHealth and One Health will provide input on our diagnostic engine enabling us to continually improve upon it. Infectious disease emergence is a global-scale challenge requiring an extended, engaged community to monitor, track and respond to new threats; it is also also intrinsically interdisciplinary given the complex life histories of many disease agents.

Ontologies are invaluable tools in artificial intelligence systems, decision support systems, data exploration and research where they can be used to make complex inferences and generate rich datasets. We seek to expand the scope of our ecological ontologies by considering taxonomic, distribution, ecological niche, and networks for pathogens and hosts. This will help us provide state of the art diagnostics for the BSVE by providing structured data from which we can make inferences with GRITS diagnostic algorithms. We plan to use the biointelligence extracted from news media and submitted by GRITS users to assemble a corpus of new information to form the basis of new relationships and entities within biological ontologies to help explain patterns of disease emergence. We are interested in incorporating these relationships and entities into public ontologies they derive from or relate to so that other projects benefit from our work. Our goal, with the work we propose, is to push our system so that more components operate in near-real-time, provide recommendations of to users for additional data-sources, work with citizen scientists to expand the data inputs to diagnostic tools, and integrate various GRITS components into the BSVE community.

C. Programmatics

This effort will support DoD CBDP, DTRA, and the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), HDTRA1-14-CHEM-BIO-BAA, Chemical Biological Technologies Department and is submitted in response to Topic: CBA-03: Next Generation Analytic Capabilities for BSV. The work will support DTRA's mission to safeguard America and its allies from biological WMDs by providing diagnostic capabilities to reduce, eliminate, and counter microbial threats. Specifically this "Global Rapid Identification Tool System" is aimed at developing capacity for the detection of EID threats, to support protection efforts and mitigation of the threats posed by disease agents through the New Initiatives in Science and Technology program. This technology is intended for eventual transition through the DTRA R&D Enterprise.

Management plan

Our management plan blends strong scientific expertise in global EID surveillance, with agile software engineering as well as iterative and incremental rapid application development. The project will be managed by our team of data scientists and software developers at EcoHealth Alliance, in consultation with thought leaders in the field of biosurveillance (Epidemico & ProMED-mail), and infused with innovative technologies Kitware Inc., developers of leading edge, high quality software.

Key personnel (roles/responsibilities)

- EcoHealth Alliance (prime): management, delivery, software integration, computing, diagnostic analysis, data science, data mining, disease ecology
    - TBD (Principal Investigator - PI)
- Kitware Inc.: data management, visualization
    - Jeff Baumes, Ph.D. (Technical Sub-contractor)
- Epidemico: data curation, digital surveillance
    - John Brownstein, Ph.D. (Scientific Consultant)
- ProMED-mail: data curation, disease outbreak reporting
    - Larry Madoff, Ph.D. (Scientific Consultant)

Current data providers and collaborating centers:

- **ProMED-mail** - the Program for Monitoring Emerging Diseases - is an open source Internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants. Electronic communications enable ProMED-mail to provide up-to-date and reliable news seven days a week. Sources of information include media reports, official reports, online summaries, local observers, and others. A team of expert moderators screen, review, and investigate reports before posting to the network and distributing by email. ProMED-mail currently reaches over 40,000 subscribers in at least 185 countries.
- **Healthmap** - The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health.

- **Global Repository of Infectious Disease (GRID) project** - an EHA project describing the initial emergence of global infectious disease bioevents since 1940. We collected direct language from the primary literature describing the agent, time, place, impact, transmission, host, driver, EID category, and economics of the event to discover patterns and trends among these variables across time and space. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities.
- **GIDEON** - Global Infectious Disease and Epidemiology Network - is the world's premier global infectious diseases knowledge management database. It contains a diagnostic module that employs information on symptoms, country, incubation period, and laboratory tests to construct a ranked differential diagnosis. The Infectious Diseases module encompasses over 340 infectious diseases, 231 countries, over 500 anti-infective drugs and vaccines.
- **PubMed, Google Scholar, and Web of Science** - will be used to generate records of confirmed diagnoses and historical outbreaks. Additionally, we hope to explore archival resources such as CDC disease reports.

D. Relevance

Our goal with this project is to develop a tool system of high-relevance to DTRA's Goals and Objectives. With the support of DTRA, we could advance our GRITS to full development and extend timely operational capability to all sectors affected by the threat of EIDs. This state-of-the-art technology will help advance our readiness to combat the broad class of biological threats posed by EIDs, including the capability to identify agents with the potential to be used as WMDs. We have the expertise and capacity to ensure useable capability of the GRITS application within the timeline of tasks we propose. The tools will provide near-real-time decision support to end-users of GRITS and the BSVE. By using open source and transparent methods, we ensure that our results are reproducible and that the technology is portable, reliable, agile, and flexible in confronting emerging threats. The tools we propose are state-of-the-art, both scientifically and technically. GRITS leverage the latest reactive web technologies (e.g. Meteor), visualization environments (e.g. WebGL and Tangelo), and scientific databases (e.g. Girder). The machine learning and clustering algorithms are drawn from Scikit-learn, an open and accessible, community-supported Python library.

A key strategy in mitigating EID risk is to build situational awareness as far forward from our shores as possible, by using advanced digital biosurveillance to detect early signals that portend the emergence of high-risk, priority diseases and pathogens, including bioterrorism agents. This biosurveillance technology is adaptable to low resource settings, among them those most vulnerable to EIDs. Ultimately we hope to empower our warfighters and allies with the tools necessary to adapt and shape the dynamic Global Security Environment, as it pertains to the acute threat of infectious diseases.

Responses to DTRA's questions from the White Paper

How will the proposed system be sustained? Is a fee for service model envisioned? If so, details should be provided.

We propose providing to DTRA all of the data hosted in GRITS.db and all of the code developed for this proposed system under permissive open source licences (e.g. MIT and Apache2). Furthermore, EHA has established the Data Science and Research Technology (DART) lab with the express goal of supporting the services outlined in this proposal. We envision sustaining the

service under a 'fee for service' model to be negotiated with DTRA upon delivery of the work. We would do so in coordination from our technical subcontractor, Kitware Inc., who have extensive experience supporting open source development for federal agencies, including DOD. Our data subcontractors have agreed to make the full data available to DTRA spanning the duration of the contract (beginning Jan 18, 2013). Where copyright restrictions limit our ability to distribute the full text of the media, we will provide programmatic tools to retrieve the text in compliance with the terms and conditions of the source. Continued access to our experts via GRITS.net, could also be negotiated with all parties under a fee for service model. Additionally, we propose a 'freemium' mechanism to sustain data hosting and processing costs, whereby DTRA-approved users or organizations could access the service on a pay-as-you-go basis (e.g. paying for characters processed or volume stored).

What will actually be delivered to the Government/BSVE? Will this simply be an API to the EHA system, or will underlying tools and data be delivered? If yes, please clearly describe all deliverables.

We are prepared to deliver all materials developed through the contract under permissive open source licenses. Given the complexity of the system, and the maintenance burden, we recommend that that the DART lab continue to maintain the materials on a mutually agreed upon third party service (e.g. AWS) and provide the access to the data and diagnostic capabilities through our API. The source code will be made available through a private Github repository. We will provide full documentation, as we have done for the data service we are currently providing to the BSVE developed by Digital Infuzion. This applies to all deliverables, including GRITS.app, GRITS.db, and GRITS.md. The GRID platform has been developed with support from other agencies, foundations, and universities; however, we will provide unlimited access in perpetuity to DTRA via the API and web interface. The source code for Tangelo visualizations Girder are publicly available on Github and permissively licensed.

III. Credentials

A. Summary of Credentials

EcoHealth Alliance (EHA):

Building on over 40 years of groundbreaking science, EHA is a global nonprofit organization dedicated to protecting wildlife and safeguarding human health from the emergence of disease. The organization develops ways to combat the effects of damaged ecosystems on human and wildlife health. Using environmental and health data covering the past 60 years, EHA's scientists created the first ever global disease hotspots map that identified at-risk regions, to help predict and prevent the next pandemic crisis. That work is the foundation of EHA's rigorous, science-based approach, focused at the intersection of the environment, health and capacity building. Working in the U.S. and more than 20 countries worldwide, EHA's strength is founded on innovations in research, training, global partnerships, and policy initiatives.

EHA is a partner of the USAID Emerging Pandemic Threats PREDICT program, a $75 million effort focused on predicting and preventing pandemic diseases. PREDICT is building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people (zoonotic diseases). PREDICT has developed a SMART surveillance method (Strategic, Measurable, Adaptive, Responsive, and Targeted) that accounts

for the fact that zoonotic pathogens, such as influenza and SARS, are responsible for the majority of emerging infectious diseases in people, and that more than three quarters of these emerging zoonoses are of wildlife origin. The SMART surveillance approach is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. It also targets sentinel animal species at active human interfaces in hotspot regions to improve surveillance efficiency.

The PREDICT team builds on a broad coalition of partners to develop the global capacity to monitor diseases at the animal-human interface and develop a risk-based approach to concentrate these efforts in surveillance, prevention, and response at the most critical points for disease emergence from wildlife.

PREDICT project objectives:

- Assess local surveillance capacity;
- Implement targeted and adaptive wildlife disease surveillance systems;
- Develop and deliver new technologies to improve efforts close to the source;
- Use cutting-edge information management and communication tools to bring the world closer to realizing an integrated, global approach to emerging zoonotic diseases.

Partners:

HealthMap/Epidemico

Healthmap is a team of researchers, epidemiologists and software developers based out of the Children's Hospital, Boston. Founded in 2006, Healthmap is an established global leader in utilizing online informal sources for disease outbreak monitoring and real-time surveillance of emerging public health threats. The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases for a diverse audience including libraries, local health departments, governments, and international travelers. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health. Through an automated process, updating 24/7/365, the system monitors, organizes, integrates, filters, visualizes and disseminates online information about emerging diseases in nine languages, facilitating early detection of global public health threats.

ProMED

ProMED-mail was established in 1994 with the support of the Federation of American Scientists and SatelLife. Since October 1999, ProMED-mail has operated as an official program of the International Society for Infectious Diseases, a nonprofit professional organization with 20,000 members worldwide.

Kitware, Inc.

Kitware, Inc. creates and supports leading edge, high quality software in the fields of computer vision, medical imaging, visualization, 3D data publishing, and technical software development. Kitware employs an open source development model to foster extended, collaborative communities, and an open source business model to provide flexible, low-cost technical solutions. The Company's services and products include technology integration, software

support, consulting, custom application development, and training and productivity tools that leverage our open-source software systems.

B. Summary of Qualifications for PI and Key Personnel

TBD (PI), will lead the Data Science and Research Technology group at EcoHealth Alliance. EcoHealth Alliance is currently in the process of filling this role. The PI will have a background in ecology and health, as well as expertise managing technical projects, and candidates will be reviewed by DTRA to ensure that they are qualified. The PI and the team will contribute expertise in geospatial data and analysis of the ecological origins of infectious disease emergence and digital disease surveillance.

Dr. John Brownstein is an Associate Professor at Harvard Medical School and directs the Computational Epidemiology Group at Children's Hospital Informatics Program in Boston. His group is supported by a multi-million dollar budget with support from NIH (NLM and NIAID), USAID, Centers for Disease Control and Prevention, and Google.org. He has pioneered efforts in participatory epidemiology, using statistical and informatics approaches aimed at improving public health surveillance and practice. He recently was awarded the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government to outstanding scientists and engineers.

Dr. Lawrence Madoff is an infectious disease physician whose career has been devoted to disease surveillance. Dr. Madoff is the Editor of ProMED-mail, which uses Internet-based communication and social media to detect and report emerging infectious diseases globally. He is currently Director of the Division of Epidemiology and Immunization at the Massachusetts Department of Public Health, which oversees infectious disease surveillance and immunization activities in the state. He is a fellow of the American College of Physicians and a Fellow of the Infectious Disease Society of America.

Dr. Jeff Baumes is a technical lead at Kitware Inc. He has significant expertise in information analysis and presentation. His contributions include novel graph clustering algorithms that allow cluster overlap, and algorithms for discovering subsets of individuals persistently connected over time. Over the last six years, he has been a major technical contributor to the open source Titan scalable analysis and visualization toolkit, which is an extension of the Visualization Toolkit to include informatics and information visualization capabilities. He has worked on projects in several fields surrounding Titan such as text analysis, bioinformatics, and social network analysis including funding from NSF, DOD, DOE, and NIH.

C. Summary of Facilities to Perform the Proposed Work

Facilities at EcoHealth Alliance (EHA)

EcoHealth Alliance (EHA) is a 501(c)(3) nonprofit organization that specializes in scientific research on the causes, origins, and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory. A core administrative staff of 11 employees support EHA's scientific team (15 core scientists, 100+ field staff) and are available for work on this project through foundation support. EHA is equipped with 25 networked PCs including ARRA funded International Live Meeting Video Conferencing facilities. EHA has

access to multiple servers, server support, and all necessary software on Mac, Linux, and Windows operating systems. Additional computing power is acquired from commercial cloud providers to meet project needs.

EHA has an active program of staff development and this is reviewed and adjusted annually as part of each employee's evaluation process. Specific provisions are made for internal training and external training resources, tuition support programs via a partnership with Columbia University, and active support of staff to spend time in collaborators organizations. All early stage investigators are mentored to provide guidance in research practices, grant management, administration and project management. Financial support from EHA core funds are available to support external tuition, travel to conferences and to conduct joint research in collaborator's institutions. There is no obligation for teaching time at EHA and all research staff are funded for 100% research time, however, there is a provision, through partnership with Columbia University, to enable staff to teach at the undergraduate and graduate level, with monetary support provided by Columbia University. Administration and other staff are supported in their efforts to enhance their careers by the provision of tuition fees for external courses, travel funds for conferences, and time off their core activities.

Facilities at Kitware Inc.
Kitware Inc. is headquartered just north of Albany, New York in a Clifton Park office complex. Kitware rents approximately 27,000 square feet of office space at this location. Kitware also has an office in Chapel Hill, North Carolina approximately 6,200 square feet in size. Both offices are linked via a common virtual private network and a shared phone system, and share financial and administrative personnel. They also have on-site office managers, lunchrooms, private meeting rooms, and advanced conference facilities including large screen projection systems and whole-room Polycom video conferencing systems. The proposed work will be performed at the Clifton Park site.

Kitware has a mixed environment of personal and shared computing platforms. Employees average three computers per person (desktop, laptop, and/or home system), with each computer typically equipped with multiple multi-core processors, a high-performance graphics card, dual monitors, and 8GB or more of main memory. These personal systems run a mix of Windows, Mac OS X, and Linux operating systems. Shared resources include compilation and testing farms as well as workstations running a variety of alternative operating systems for testing purposes, e.g., Windows XP or Vista. Kitware also maintains several servers to provide public access to the open source VTK, ITK, TubeTK, Titan, Slicer, CMake, and ParaView systems; to host web pages and web services for open source communities such as NA-MIC and Visomics; to operate open-access journals such as the Insight Journal and the Midas journal which has hosted workshop papers for nearly ten years; and to provide access to massive collections of public data for computer vision and medical imaging algorithm evaluation. Access to these systems is provided by a fiber connection to the internet yielding a total of 100 Mbit/second data rate.

Kitware hosts several special-purpose, high-end workstations, GPU systems, haptic systems, and magnetic and optical trackers. One such workstation is a multi-GPU computer featuring 6 NVidia GPU boards: 5 C2050 Tesla and 1 Quadro 5000 Fermi, as well as a 6-Core X5680

3.33GHz processor. A noteworthy haptic system is a MBP Freedom 7S haptic device, configurable for 6 or 7 degrees of freedom. To address large-scale distributed computing, the company maintains several clusters for development and testing. The clusters include: a twelve node testing cluster running mixed Linux and Windows operating systems; a four node Windows cluster with a gigabit Ethernet network; and a seven node Linux cluster with dual 64-bit Xenon processors, high-end graphics accelerators, and an Infiniband network driving a 3x2 PowerWall display. Kitware also has access to several external computer systems (e.g. HP, IBM, and Intel) through various vendor partnership programs.

IV. WORK TO BE PERFORMED.

A. General

Our goal over the 3-year time period is to expand our DTRA-funded GRITS platform to deliver near-real-time disease diagnostics, decision support, and data processing. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, and connected to our network of experts from One Health, EcoHealth, and open source communities.

We are currently building a robust and scalable software infrastructure to provide a diagnostic decision support system for analysts with multiplier effects by connecting to a community of experts and data from EcoHealth Alliance, HealthMap, and ProMED-mail. The final deliverable will include our user interface (GRITS.app), application interface (GRITS.api), network of experts (GRITS.net), media diagnostics (GRITS.md), and database (GRITS.db). Overall, GRITS will be deployable and generalized application that will output probabilities and lists of pathogens likely responsible for an outbreak on the basis of user-provided data. Accordingly, the resource will be adaptable to a specific organization or agency's needs or emerging threats, and geographic areas of high concern. The source code for this algorithm will be made available to interested parties for further development and adaptation.

The original Rapid Identification Tool (RIT) prototype was developed by manually extracting symptoms from encephalitides reports in ProMED-mail to train a diagnostic model. Through rigorous testing, we identified modeling approaches that improved performance by combining natural language processing and machine learning algorithms. We recognized automated data collection and crowdsourced data curation would be needed to scale to disease coverage and diagnose additional diseases with greater precision. The GRITS diagnostic dashboard provides decision support to experts at our partner organizations by automatically extracting and visualizing information from media. We leverage crowdsourcing techniques by providing experts with tools for curating disease portfolios and annotating articles. We have developed an application programming interface (API) for access to our data and diagnostics by third party developers and users. Additionally, we integrated the project with an ongoing EHA initiative to collect historical disease outbreak data (Global Repository for Infectious Diseases - GRID). Finally, we integrated work from our colleagues at Kitware to support the storage and visualization of the large, complex datasets being generated.

During the proposed contract period, we will improve the accuracy and robustness of the GRITS media diagnostics. We will design new visualizations for the diagnostic dashboard to allow users to gain additional insights into our data and tools; develop a near-real-time processing stack to enable our visualizations and diagnostics to use the latest information; gain additional

advantages from our collective intelligence network by adding new mechanisms for experts to provide feedback and interact with our underlying data, rules, and algorithms; experiment with crowdsourcing as an additional source of training data and knowledge to further improve GRITS.md; and expand the capabilities of the system to provide decision support and recommendations to analysts.

By the end of the contract period GRITS will provide:

1. Robust architecture for near-real-time diagnostics and data processing
2. Interface from BSVE to GRITS with SDK
3. Healthmap, ProMED-mail, and EcoHealth data to the BSVE
4. Machine, expert, and community intelligence

Diagnostic modeling
We plan to use the biointelligence extracted from news media and submitted by GRITS users to form the basis of new relationships and entities within biological ontologies that link EID events, diseases, symptoms, hosts, and other entities and attributes related to infectious diseases together in a rich network structure. This ontology will be a critical data source for making domain specific inferences in diagnostic algorithms.

Data Storage and Management
Girder is a data management platform built to meet the needs of distributed, data-centric web applications. Girder is a modular framework that allows developers to build systems that use any or all of the components necessary to create a system tailored to their needs. All data sharing web applications need the same core functionality: upload, download, large data storage, supplemental metadata storage and indexing, authentication/authorization, a RESTful API, and an extensible plugin architecture. Girder provides these components and is currently being used for GRITS as well as several DOE projects.

Visualization
Tangelo is a system for rapid production of visual and interactive web applications. Using HTML5 standards such as SVG, WebGL, and 2D canvas, Tangelo integrates visualization modes spanning charts, hierarchical diagrams, and networks for time series, heterogeneous, or multivariate data. Tangelo provides interfaces to powerful visualization libraries such as GeoJS, ParaViewWeb, and D3.

B. Summary

Year 1 (2015)
1. Connect GRITS Girder database to the BSVE
2. Develop recommendation and decision support capabilities
3. Connect GRITS diagnostic and text-mining APIs to the BSVE
4. Prototype near-real-time processing
5. Build BSVE interface to GRITS with the SDK
6. Connect GRITS expert network (GRITS.net) to the BSVE

Year 2 (2016)
7. Build mechanisms to crowdsource annotations

8. Incorporate disease network graphs to assist diagnostics
9. Support diagnostic algorithm development with dashboard
10. Expand diagnostic capability to arbitrary data feeds
11. Connect GRITS to GRID
12. Update diagnostic model in near-real-time
13. Use text mining to extend network graphs/ontologies.

Year 3 (2017)

14. Crowdsource improvements to the GRITS media diagnostic tool
15. Connect GRID's collective intelligence editor to the BSVE
16. Connect GRITS diagnostic data filtering to the BSVE
17. Enrich diagnostic dashboard with dynamic visualizations
18. Generate disease summary reports from diagnostics
19. Forecast disease emergence

C. Detailed Tasks

Task 1: Connect GRITS Girder database to the BSVE

Description: Coordinate with BSVE developers to provide API access to GRITS database (HealthMap, ProMED and EcoHealth data with diagnostic metadata).
Resources: EcoHealth & Kitware (API, BSVE support), HealthMap & ProMED (data)
Metric(s) of success: BSVE access to GRITS data via API
Deliverable: API key and access for the BSVE team, communication between BSVE/GRITS
Subtasks:

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities

Description: Use our GRITS.md to extract features of incoming articles to inform media recommendations for analysts based on areas or keywords of interest or a collection of documents being evaluated. Identify targets for data collection that would most enhance diagnostic capabilities for a particular event.
Resources: EcoHealth (algorithms and infrastructure), Kitware (storage & visualization), HealthMap & ProMED (testing)
Metrics of success: Recommendation system returns relevant articles, people and organizations. Adding recommended information improves diagnosis.
Deliverable: API and diagnostic dashboard interface to recommendations
Subtasks:

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article

7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE
Description: Provide BSVE developers with API access to GRITS media diagnostics and text mining tools and support them as they integrate these features into the BSVE interface.
Resources: EcoHealth (API development, BSVE support)
Metrics of success: BSVE team satisfied with API structure. GRITS features and diagnoses accessible through BSVE.
Deliverable: API access for the BSVE team, communication between BSVE/GRITS.
Subtasks:
1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing
Description: Develop near-real-time architecture based on ideas from the lambda architecture, which allows high-performance integration of near-real-time streaming data with pre-processed data. Evaluate possible software tools for each component. Set up prototype of software stack.
Resources: EcoHealth & Kitware (architecture, software evaluation, prototyping)
Metrics of success: Working prototype
Deliverable: Documentation of software architecture and choices, working prototype
Subtasks:
1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK
Description: Build an app on the BSVE SDK that allows BSVE users to submit text to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards where users can see additional visualizations and interact further with GRITS diagnostic tools.
Resources: EcoHealth (app development & testing)
Metrics of success: Users able to access GRITS through app deployed to BSVE
Deliverable: Deployed app, BSVE users able to access diagnostic dashboards
Subtasks:
1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

Description: GRITS is a bridge to experts from ProMED, HealthMap and EcoHealth. Two-way communication will benefit both BSVE and GRITS. We will develop mechanisms for BSVE users to submit requests for language, region, and diagnostic feedback, while allowing experts and organizations to opt-in and set availability to handle requests.
Resources: EcoHealth (experts and interface), ProMED and HealthMap (expertise)
Metrics of success: BSVE user can submit request to a GRITS expert. Language, region, and diagnostic expertise is available to DTRA and BSVE users.
Deliverable: BSVE interface through GRITS app to submit requests to experts
Subtasks:

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Build mechanisms to crowdsource annotations
Description: Identify human intelligence annotation tasks for crowdsourcing by citizen scientists and Amazon's Mechanical Turk
Resources: EcoHealth (annotation interface), Mechanical Turk (pay for annotations), Citizen Scientists (volunteers)
Metrics of success: Annotations crowdsourced. Improves diagnostics from annotations.
Deliverable: Crowdsourced annotations incorporated into GRITS training data
Subtasks:

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 8: Incorporate disease network graphs to assist diagnostics
Description: Model the geographic, ecological, and information structure of infectious disease networks and connect them to diagnostic API. Develop visualizations for diagnostic dashboard.
Resources: EcoHealth & Kitware (network modeling, visualization)
Metrics of success: Improved diagnostics from network reasoning
Deliverable: Visualizations of the network model in the diagnostic dashboard
Subtasks:

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 9: Support diagnostic algorithm development with dashboard
Description: Support multiple models for diagnosis, and continually reevaluate their effectiveness. Different algorithms may perform differently with time, origin, or diseases. Allow users to run and compare the results of different models via the diagnostic dashboard. Run automated jobs to compare the performance of models over time.
Resources: EcoHealth & Kitware (algorithm and interface development)
Metrics of success: Run and compare models from the dashboard
Deliverable: Capacity to compare model performance in the dashboard

Subtasks:

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 10: Expand diagnostic capability to arbitrary data feeds
Description: Develop robust scraping algorithms and provide an interface for users to connect data sources to GRITS.
Resources: EcoHealth (algorithms), Language translation service
Metrics of success: Users can submit relevant feeds to the GRITS system
Deliverable: Interface for submitting data feeds
Subtasks:

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 11: Connect GRITS to GRID
Description: Incorporate GRID dataset into GRITS to give the platform a comprehensive historical perspective on EIDs and enhance analytic capabilities around drivers of disease behavior. Extend the recommendation system to include historic context from GRID (e.g. media and data). Use historic event data to expand to match targets for a disease or keyword.
Resources: EcoHealth (recommendation system, GRID)
Metrics of success: Diagnostic decision support enriched by **historic event data**
Deliverable: Improved recommendation system, match new reports with historic events
Subtasks:

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 12: Update diagnostic model in near-real-time
Description: Retrain the classifier with new reports from HealthMap/ProMED or users submissions. Classify labeled training data with GRITS, for example correcting misclassification. Investigate classifiers capable of distributed training or incremental retraining.
Resources: EcoHealth (algorithm and architecture development)
Metrics of success: Model updates improve performance. Near-real-time classifier updates.
Deliverable: Enhanced classification infrastructure, retraining interface
Subtasks:

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 13: Use text mining to extend network graphs/ontologies
Description: Use features extracted from disease reports to add entities and relationships to a disease network ontology. For example, linking case counts to locations.
Resources: EcoHealth (feature extraction and ontologies)

Metrics of success: Accuracy of entities and relationships extracted from our data sources.
Deliverable: An extended ontology generated by text-mining algorithms
Subtasks:

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 14: Crowdsource improvements to the GRITS media diagnostic tool
Description: Sponsor public challenges (e.g. Kaggle) to solicit improvements to the GRITS media diagnostic by training better classifiers or by submitting additional training data.
Resources: EcoHealth & Kitware (challenge planning and execution)
Metrics of success: User submits an improvement with better performance (e.g. higher f-score)
Deliverable: Improved diagnostic tool from crowdsourced algorithms.
Subtasks:

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 15: Connect GRID collective intelligence editor to the BSVE
Description: Incorporate BSVE users as experts for the review and editing GRID events
Resources: EcoHealth (GRID)
Metrics of success: BSVE users contribute to GRID. Diagnostic models improve from GRID data. Additional features are extracted based on GRID data.
Deliverable: BSVE/GRITS access to GRID, improved diagnostics and feature extraction
Subtasks:

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 16: Connect GRITS diagnostic data filtering to the BSVE
Description: Use diagnostics to reduce data volume to relevant reports. Users should be able to list diseases or regions of interest.
Resources: EcoHealth (GRITS integration), Kitware (data filtering)
Metrics of success: GRITS will return a subset of related assets
Subtasks:

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 17: Enrich diagnostic dashboard with dynamic visualizations

Description: Add dynamic Tangelo visualizations, including interactive dendrogram views of likely diseases, multidimensional visualization of report space, and flexible geovisualizations with interactive vector graphics for high-performance imagery and dense data.
Resources: EcoHealth (GRITS integration), Kitware (visualizations)
Metrics of success: Visualizations enrich expert decisions on diagnosis
Subtasks:

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 18: Generate disease summary reports from diagnostics
Description: Aggregate the data collected by text-mining and diagnostic algorithms to give an meta overview of a collection of reports or disease outbreak.
Resources: EcoHealth (algorithms and reporting)
Metrics of success: Number of visits per unique user to the summary report website
Deliverable: API returns summary reports to diagnostic dashboard and BSVE
Subtasks:

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 19: Forecast disease emergence
Description: EHA are experts in disease hotspot mapping. Use GRITS.db and GRITS.md to iidentify diseases that pose the greatest threat. Use case-counts and data from historical epi curves to model probable epi curves for new diseases

EHA Budget	Year 1		Year 1 Total	Year 2		Year 2 Total	Year 3		Year 3 Total	TOTAL
Direct Labor	*Rate (hour)*	*Quantity (hours)*		*Rate (hour)*	*Quantity (hours)*		*Rate (hour)*	*Quantity (hours)*		
PI Dr. Nico Preston (Director)	$67.00	1560	$104,520.00	$69.01	1560	$107,655.60	$71.08	1560	$110,885.27	$323,060.87
Senior Data Scientist (III)	$48.00	2080	$99,840.00	$49.44	2080	$102,835.20	$50.92	2080	$105,920.26	$308,595.46
Data Scientist (II)	$46.35	1040	$48,204.00	$47.74	1040	$49,650.12	$49.17	1040	$51,139.62	$148,993.74
Data Scientist (II)	$46.35	1040	$48,204.00	$47.74	1040	$49,650.12	$49.17	1040	$51,139.62	$148,993.74
Lead Developer (III)	$47.00	2080	$97,760.00	$48.41	2080	$100,692.80	$49.86	2080	$103,713.58	$302,166.38
Research Scientist (II)	$24.00	1560	$37,440.00	$24.72	1560	$38,563.20	$25.46	1560	$39,720.10	$115,723.30
Research Assistant (I)	$18.19	2080	$37,835.20	$18.74	2080	$38,970.26	$19.30	2080	$40,139.36	$116,944.82
Program Coordinator (II)	$24.72	2080	$51,417.60	$25.46	2080	$52,960.13	$26.23	2080	$54,548.93	$158,926.66
Total Direct Labor		**13520**	**$525,220.80**		13520	**$540,977.42**		13520	**$557,206.75**	$1,623,404.97
Fringe Benefits	0.323		$169,648.32	0.328		$177,440.60	0.333		$185,549.85	$532,636.76
Total Labor			**$694,867.12**			**$718,418.02**			**$742,756.59**	**$2,156,041.73**
	Cost	*Quantity*		*Cost*	*Quantity*		*Cost*	*Quantity*		
Travel										
1 person to Boston (HealthMap & ProMED)	$596.50	2.00	$1,193.00	$614.40	2.00	$1,228.79	$632.83	2.00	$1,265.65	$3,687.44
1 person to North Carolina (Kitware)	$457.00	2.00	$914.00	$470.71	2.00	$941.42	$484.83	2.00	$969.66	$2,825.08
2 people to Clifton Park, NY (Kitware)	$725.00	2.00	$1,450.00	$746.75	2.00	$1,493.50	$769.15	2.00	$1,538.31	$4,481.81
2 people to DC (DTRA)	$1,401.00	2.00	$2,802.00	$1,443.03	2.00	$2,886.06	$1,486.32	2.00	$2,972.64	$8,660.70
2 people to Digital Disease Detection Conf.	$3,707.00	1.00	$3,707.00	$0.00	0.00	$0.00	$0.00	0.00	$0.00	$3,707.00
Materials & Equipment		*Quantity*			*Quantity*			*Quantity*		
Cloud Processing	$1,000.00	12.00	$12,000.00	$1,000.00	12.00	$12,000.00	$1,000.00	12.00	$12,000.00	$36,000.00
Data purchasing	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$7,200.00
Computer supplies	$330.00	12.00	$3,960.00	$330.00	12.00	$3,960.00	$330.00	12.00	$3,960.00	$11,880.00
Services		*Quantity*			*Quantity*			*Quantity*		
Code hosting	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$7,200.00
Data hosting	$156.79	12.00	$1,881.48	$156.79	12.00	$1,881.48	$156.79	12.00	$1,881.48	$22,577.76
Other expenses		*Quantity*			*Quantity*			*Quantity*		
Meeting support	$250.00	2.00	$500.00	$250.00	2.00	$500.00	$250.00	2.00	$500.00	$1,500.00
Recruiting costs	$0.00	0.00	$0.00	$550.00	1.00	$550.00	$550.00	1.00	$550.00	$1,100.00
Publication costs	$2,250.00	2.00	$4,500.00	$2,250.00	2.00	$4,500.00	$2,250.00	2.00	$4,500.00	$13,500.00
Total Materials & Equipment			**$37,707.48**			**$34,741.25**			**$34,937.74**	**$124,319.79**
Subcontractor Costs	*Rate (hour)*	*Quantity*		*Rate (hour)*	*Quantity*		*Rate (hour)*	*Quantity*		
Kitware										
Dr. J.Baumes (47.43)	$48.22	835.19	$40,272.86	$49.67	835.19	$41,481.05	$51.16	835.19	$42,725.48	$124,479.39
Patrick Reynolds (49.34)	$44.81	835.19	$37,424.86	$46.15	835.19	$38,547.61	$47.54	835.19	$39,704.04	$115,676.51
R&D Engineer (43.92)	$44.31	1,182.22	$52,384.17	$45.64	1,182.22	$53,955.69	$47.01	1,182.22	$55,574.36	$161,914.23
R&D Engineer (43.92)	$44.31	1,182.22	$52,384.17	$45.64	1,182.22	$53,955.69	$47.01	1,182.22	$55,574.36	$161,914.23
1 trip to NYC for 2 people	$806.00	2.00	$1,612.00	$830.18	2.00	$1,660.36	$855.09	2.00	$1,710.17	$4,982.53
1 trip to DC for 2 people	$1,242.00	2.00	$2,484.00	$1,279.26	2.00	$2,558.52	$1,317.64	2.00	$2,635.28	$7,677.80
Indirect Costs	0.828		$154,473.39	0.828		$159,107.59	0.828		$163,880.82	$477,461.79
General & Administrative	0.384		$130,957.61	0.384		$134,886.34	0.384		$138,932.93	$404,776.88
7% profit fee			$33,039.51			$34,030.70			$35,051.62	$102,121.83
		Subtotal	$505,032.58			$520,183.55			$535,789.06	$1,561,005.19
Epidemico (Healthmap)										
Dr. J. Brownstein	$77.25	800.00	$61,800.00	$79.57	800.00	$63,654.00	$81.95	800.00	$65,563.62	$191,017.62
Clark Freifeld, Senior Programmer	$55.00	800.00	$44,000.00	$56.65	800.00	$45,320.00	$58.35	800.00	$46,679.60	$135,999.60
Harold Rodriguez, Programmer	$37.55	1,880.00	$70,594.00	$38.68	1,880.00	$72,711.82	$39.84	1,880.00	$74,893.17	$218,198.99
Kate O'Brien, Front-end Software Developer	$32.19	1,760.00	$56,654.40	$33.16	1,760.00	$58,354.03	$34.15	1,760.00	$60,104.65	$175,113.08
Clu Balik, Project Manager	$29.51	1,880.00	$55,478.80	$30.40	1,880.00	$57,143.16	$31.31	1,880.00	$58,857.46	$171,479.42
Carrie Pierce, Data Curator	$29.51	1,880.00	$55,478.80	$30.40	1,880.00	$57,143.16	$31.31	1,880.00	$58,857.46	$171,479.42
HealthMap License Fee			$10,000.00			$10,000.00		0.00	$10,000.00	$30,000.00
1 trip to NYC for 2 people	$1,500.00	2.00	$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35	2.00	$3,182.70	$9,272.70
1 trip to DC for 2 people	$1,342.00	2.00	$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73	2.00	$2,847.46	$8,295.98
Indirect Costs	0.10		$35,969.00	0.10		$37,018.07	0.10		$38,098.61	$111,085.68
		Subtotal	$395,659.00			$407,198.77			$419,084.73	$1,221,942.50
ISID (ProMED-mail)										
L. Madoff - Editor	$88.70	192.00	$17,030.40	$91.36	192.00	$17,541.31	$94.10	192.00	$18,067.55	$52,639.26
D. Tenenholz - IT Man.	$48.83	306.00	$14,941.98	$50.29	306.00	$15,390.24	$51.80	306.00	$15,851.95	$46,184.17
Fringe Benefits		0.30	$9,691.71	0.30		$9,879.47	0.30	0.00	$10,175.85	$29,647.03
Consultant - M. Pollack - Deputy Editor	$78.85	200.00	$15,770.00	$81.22	200.00	$16,243.10	$83.65	200.00	$16,730.39	$48,743.49
Consultant - Associate Editor	$22.15	1,970.00	$43,635.50	$22.81	1,970.00	$44,944.57	$23.50	1,970.00	$46,292.90	$134,872.97
Consultant - Copy Editor	$29.50	160.00	$4,720.00	$30.39	160.00	$4,861.60	$31.30	160.00	$5,007.45	$14,589.05
1 trip to NYC for 2 people	$1,500.00	2.00	$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35	2.00	$3,182.70	$9,272.70
1 trip to DC for 2 people	$1,342.00	2.00	$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73	2.00	$2,847.46	$8,295.98
Indirect Costs	0.15		$16,706.04	0.15		$17,207.22	0.15		$17,723.44	$51,636.70
		Subtotal	$128,079.63			$131,922.02			$135,879.68	$395,881.34
Total Subcontractor Costs	**Rate**		**$1,028,771.21**	**Rate**		**$1,059,304.35**			**$1,090,753.48**	**$3,178,829.03**
Total Direct Costs			$1,761,345.81			$1,812,463.61			$1,868,447.81	$5,442,257.24
Modified Direct Costs			$807,574.60			$828,159.27			$852,694.34	$2,488,428.20
Total F&A	0.441		$356,140.40	0.441		$365,218.24	0.441		$376,038.20	$1,097,396.84
Total Cost			**$2,117,486.21**			**$2,177,681.85**			**$2,244,486.02**	**$6,539,654.07**

	Alternate Titles	Monster (Salary)	Monster (Rate)	Comparable %	http://monster.salary.com/
Dir. Nico Preston (Director)	Data Management Director	$150,676.00	72.44	95%	http://www1.salary.com/NY/New-York-Data-Management-Director-Salary.html
Program Coordinator (II)	Project administrator I	$52,998.00	25.48	100%	http://www1.salary.com/NY/New-York-Project-Administrator-I-Salary.html
Research Scientist (II)	Scientist II - Biotech	$103,989.00	49.99	49%	http://h.salary.com/salarywizard/Scientist-II-Biotech-Job-Description.aspx
Research Assistant (I)	Research and development associate I	$52,994.00	25.48	74%	http://www1.salary.com/NY/New-York-Research-and-Development-Associate-I-Salary.html
Senior Data Scientist (III)	Data Architect III	$118,558.00	57.00	87%	http://swz.salary.com/SalaryWizard/Data-Architect-II-Salary-Details-10021-New-York-NY.aspx
Data Scientist (II)	Data Architect II	$106,455.00	51.18	93%	http://www1.salary.com/NY/New-York-Data-Architect-I-Salary.html
Data Scientist (II)	Data Architect II	$106,455.00	51.18	93%	http://www1.salary.com/NY/New-York-Data-Architect-I-Salary.html
Lead developer (II)	Software Developer III	$111,359.00	53.54	90%	http://www1.salary.com/NY/New-York-Software-Developer-II-Salary.html

Global Rapid Identification Tool System (GRITS)

Budget Justification

February 1, 2015 - January 31. 2018

Year 1

Direct Labor

Senior personnel

For this three-year budget period, the PI will lead the Data Science and Research Technology team and partners on this project. EcoHealth Alliance is currently in the process of filling this role. The PI will have a background in ecology and health, as well as expertise managing technical projects, and candidates will be reviewed by DTRA to ensure that they are qualified. The PI will directly supervise the team of researchers, data scientists, and developers, as well as coordinate code integration, software development, reporting, research, scientific data management, and modeling efforts.

Other Personnel

We request **$649,600** in direct labor costs to accommodate hours devoted to the project. The positions and labor rates in the cost proposal comprise the experience and skills needed to realize the work outlined in the statement of work (SOW), including data management, infectious disease expertise, mathematical modeling, software development, natural language processing, computational linguistics, machine learning, technical writing, coordination with partner organizations, and web development.

Fringe benefits

Fringe benefits are calculated for EcoHealth Alliance as 33.4% of 12-month base salary.

Our direct labor costs including fringe total **$866,566.**

Other Direct Costs

Travel

We request **$1,320** to fund 1 visit (2 people x 1 night) for the Principal Investigator and Senior Software Developer **to meet with the team members from HealthMap and ProMed Mail in Boston, MA**. Travel is calculated for 1 trip x (2 people x ((round trip airfare [$200]) + (2 travel days x [Meals and Incidentals ($71)]) + (1 night x [Hotel ($258)]))). The remaining $120 is budgeted for public transportation or cab service to and from the airport, and in Boston if necessary.

The Kitware teams are in two distinct locations. The database team is in Carrboro, NC while the visualization team is in Clifton Park, NY.

We request **$980** to fund 1 visit (2 people x 1 night) for the Principal Investigator and Senior Software Developer **to meet with the database team members at Kitware's office in Carrboro, NC**. Travel is calculated for 1 trip x (2 people x ((round trip airfare [$221]) + (2 travel days x [Meals and Incidentals ($56)]) + (1 night x [Hotel ($97)]))). The remaining $120 is budgeted for public transportation or cab service to and from the airport, and in Carrboro if necessary.

We request **$776** to fund 1 visit (2 people x 1 night) for the Principal Investigator and the Senior Software Developer **to meet with the visualization team members at Kitware's Clifton Park office outside of Albany, NY**. Travel is calculated for 1 trip x (2 people x ((round trip train [$100]) + (2 travel days x [Meals and Incidentals ($56)]) + (1 night x [Hotel ($116)]))). The remaining $120 is budgeted for public transportation or cab service to and from the airport, and in Albany if necessary.

We request **$2,516** to fund 2 visits (2 people x 1 night) for the Principal Investigator and the Senior Software Developer **to meet with the DTRA Contract Officers and BSVE team in the DC area**. Travel is calculated for 2 trips x (2 people x ((round trip airfare [$250]) + (2 travel days x [Meals and Incidentals ($71)]) + (1 night x [Hotel ($177)]))). The remaining $120 for each trip is budgeted for each person for two (2) trips to and from the airport in New York City, as well as public transportation or cab service in Washington D.C.

Additional funds of **$3,696** are requested for one trip (2 people x 4 nights) for the PI and the Senior Data Scientist **to attend the Digital Disease Detection Conference hosted by HealthMap**. This conference was hosted in San Francisco, CA in 2013, and we are using estimates from that trip to propose costs for the 2015 conference. This is the premier conference for the emerging field of digital disease detection. This meeting will provide the opportunity to showcase our work and interact with relevant peer networks. Travel is calculated for 1 trip x (2 people x ((round trip airfare [$500]) + (2 person x (5 days x [Meals and Incidentals ($56.8))) + (2 person x (4 nights x [Hotel ($251)])))). $120 is budgeted for transportation for two people to and from the airport as well as public transportation or cab service during the conference.

Travel costs for Year 1 total **$9288.**

All **Hotel and Meals & Incidentals** are calculated using FY2014 estimates in accordance with US Government Federal *per diem* regulations. The airfare or train fares are a calculated average of trips to the area during the specific time of year.

Materials and Equipment

We request **$7,256** for Materials and Equipment.
This includes two (2) new Apple 13" Macbook Air laptops. These are priced at $1,981 each (past purchase cost $1,757 each, not including warranty). This also includes (3) three

Thunderbolt Display Apple Monitors priced at $1,098 each including warranty. The additional hardware is necessary to ensure replacement equipment for EHA personnel and support efforts to complete the tasks outlined in the Statement of Work. Hardware purchases will be made in compliance with our purchasing policies, see Pricing Integrity (below).

Other Direct Costs
Other direct costs total **$30,006.**

We have budgeted **$17,094** for commercial cloud processing for modeling, data analysis, and software development through Amazon Web Services. This estimate is based on our current monthly cost ($1295 for July 2014 x 12 months), assuming our costs increase by 10% with additional usage of our services by the BSVE. These expenses reflect the computing time and resources needed by our developers to fulfill the tasks in the SOW, primarily the cost of processing high-volume, near-real-time data. AWS was selected as a sole source provider due to specific expertise. AWS is the world leader in cloud computing. AWS offers the full range of cloud computing tools, including virtual machines, storage, high performance computing, monitoring, virtual private networking, and databases. AWS has organization-wide Federal Information Security Management Act (FISMA) moderate level security certification, and has undergone multiple independent U.S. government security audit procedures.

Many costs previously grouped together under Data Hosting are delineated here:

$160 is requested to cover the annual cost for domain name and security certificates.

$840 is requested to cover the cost of Google Apps Services and data hosting ($10 per user per month for google apps with unlimited storage)

$2,400 is requested to purchase additional global datasets; all other data will be derived from the public domain to share with DTRA. Additional data purchases will be contingent on the priority diseases and regions identified in consultation with DTRA COR (SOW 3.1) and will be made in compliance with our purchasing policies (see Pricing Integrity below).

We request an additional **$2,400** ($200 per month) for code hosting with Github (Platinum) to maintain code hosting capabilities.

$711.72 is requested to cover the subscription to Safari Books Online ($46.81/month), plus 5 additional book purchases at $30 each.

$700 is requested to support additional licenses for software such as text editors and office tools (estimated $100 per person)

These code and data services facilitate rapid collaboration and ensure the resilience of the code through constant snapshots, secure hosting, version control, and routine backups. Dropbox and

Github are sole-source as specific tools that are best in class and competitively priced. Both services are irreplaceable components of our workflow at EHA. The tools are compatible with other ongoing projects for which there are no cheaper alternatives. The services are tied into our software process to ensure code integrity and to easily contribute resources from our code repositories and integrate updates from other projects. Our code is managed with Git version control for which Github is the leading commercial hosting service with instant collaboration in private and secure repositories. Dropbox is a secure cloud-based file sharing and backup service in use by over 2 million businesses. Additional information on the professional services selection process is provided in Pricing Integrity (below).

$4,500 is requested for two (2) publication fees. Our total is calculated from the average publication fee for PLOS (Public Library of Science) journals ($2,250 per publication).

$500 is requested to support two all-day meetings with the partners at the EcoHealth Alliance offices in NYC. Meetings will begin at the opening of business, requiring overnight accommodation for our subcontractors. These costs cover printing, copying, additional support for meeting materials, conference line and room usage, and other supplies to enhance partner collaboration.

$700 is requested for two 30-day listings on StackOverflow careers at $350 per listing.

Subcontracts

Funds are requested to support our subcontractors in their efforts to complete the tasks outlined in the Statement of Work. They are the same subcontractors with whom we have worked on the DTRA-funded GRITS platform.

Kitware Inc.

We request **$503,580.28** to Kitware Inc. for technical expertise in machine learning, text analysis, software development, data management, and data visualization. This covers approximately 835 labor hours for Jeff Baumes (Albany, NY) and Patrick Reynolds (Carrboro, NC), and 1182 hours of work each for two (2) R&D Engineers. They also request travel funds for two trips (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and one trip (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. These costs include 82.8% Overhead and 38.4% General and Administrative costs, the latter of which is taken from the total of direct costs and overhead costs. They request a seven percent fee, which is standard for Kitware's cost reimbursement contracts. Unlike other contracts that have fully burdened rates that incorporate individuals' actual costs, indirect costs, and profit, the profit fee is added separately in cost reimbursement contracts. The total costs are $186,120.06 (direct) and $284,754.76 (indirect and G&A), and $32,705.46 (fee).

Epidemico

We request **$356,071.82** to Epidemico for expertise in digital disease surveillance, disease

reporting expertise, disease modeling, as well as news and social media analysis. Epidemico is a spinoff from Boston Children's Hospital, Harvard Medical School, and MIT that specializes in health data collection and analytics. The subcontract will cover salary for Dr. Brownstein, Clark Freifeld, a software programmer, a software developer, a project manager, and a data curator. They also request travel funds for one trip (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and one trip (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. Also included is a $10,000 HealthMap data license fee. These costs are supplemented by a 10% indirect cost rate. The total costs are $323,370.17 (direct) and $32,3370.17 (indirect).

International Society for Infectious Diseases (ISID)

We request **$124,644.01** to ISID for disease reports, data collection, report moderating, and surveillance expertise. The subcontract will cover salary for Larry Madoff, Editor, and the IT Manager at ProMed-mail. Additional funds will support three (3) Editors who will devote time to the project and generate data. They also request travel funds for one trip (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and one trip (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. These costs are supplemented by an indirect rate of 15%. The total costs are $108,386.09 (direct) and $16,257.91 (indirect).

Indirect Costs

EcoHealth Alliance maintains efficient support logistics with a federally-approved overhead rate. We are requesting a low federally-agreed indirect rate of 44.1% on all direct costs. As per our Indirect Cost Rate agreement, we have applied our overhead rate only to the first $25,000 of each individual subcontract.

Total EcoHealth Alliance budgeted direct costs: $ 1,897,412
Total EcoHealth Alliance budgeted modified direct costs: $988,116
Total EcoHealth Alliance budgeted indirect costs: $435,759
Total EcoHealth Alliance budgeted costs: $ 2,333,171

Year 2 and Year 3

The justification for Year 1 applies to Year 2 and 3 with the following modifications.

Direct Labor

Senior personnel

Salary for the Senior Research Scientist (PI) is increased by 3% in Year 2 and 3, which is the federally agreed rate increase.

Other Personnel

All salaries are increased by 3% in Year 2 and 3, which is the federally agreed rate increase.

Fringe benefits
Fringe benefits are increased at a rate of .5% per year. For Year 2, EcoHealth Alliance has determined a rate of 33.9% of 12-month base salary. For Year 3, the determined rate is 34.4% of 12-month base salary.

Other Direct Costs

Travel
Travel estimates for trips to DC are increased by 3% in Year 2 and 3 in anticipation of higher travel costs.

Travel estimates for trips to Boston, Carrboro, and Albany to visit GRITS partners are increased by 3% in Year 2 and 3 in anticipation of higher travel costs.

All Hotel and Meals & Incidentals are calculated using the available FY2014 estimates in accordance with US Government Federal per diem regulations.

Materials and Equipment
No materials and equipment is budgeted in Year 2 and 3.

Other Expenses
There is a decrease from $700 in recruiting costs in Year 1 to $350 in recruiting costs for Year 2. There are no recruiting costs in Year 3. There are no other changes to other expenses.

Subcontracts
Salaries and travel costs increased by 3% or less.

Indirect Costs
We are requesting a low federally agreed indirect cost of 44.1% on all direct costs. EcoHealth Alliance maintains efficient support logistics with a federally approved overhead rate. As per our Indirect Cost Rate agreement, we have applied our overhead rate only to the first $25,000 of each individual subcontract.

Year 2

Total EcoHealth Alliance budgeted direct costs: $ 1,942,697
Total EcoHealth Alliance budgeted modified direct costs: $1,004,203
Total EcoHealth Alliance budgeted indirect costs: $442,854
Total EcoHealth Alliance budgeted costs: $ 1,942,697

Year 3

Total EcoHealth Alliance budgeted direct costs: $ 2,000,632
Total EcoHealth Alliance budgeted modified direct costs: $1,032,063
Total EcoHealth Alliance budgeted indirect costs: $455,140
Total EcoHealth Alliance budgeted costs: $ 2,455,772

Pricing integrity & Contractual services

Independent Contractors:

Professional services

Contracts may be entered into for professional services such as legal services, audit and accounting services, public relations services, technology services, and other services requiring specialized expertise. Contracts greater than $5,000 must be competitively bid, with a minimum of three (3) bids. In unusual situations where the expertise is extremely specific, a sole source may be chosen, and must be preapproved by the CFO.

Contracts may be drafted by EHA or the service provider, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

Costs are reviewed among competing bids, and by review of industry standards.

Professional Services contracts are approved by the CFO.

Consultants

Contracts may be entered into for consulting services to carry out specialized work on our behalf. Consultants are used either for specialized expertise not existing on staff, or to accelerate the completion of approved work. Contracts greater than $5,000 must be competitively bid, with a minimum of 3 bids. In unusual situations where the expertise is extremely specific, a sole source may be chose, and must be preapproved by the CFO.

Costs are reviewed among competing bids, and by review of industry standards.

Contracts may be drafted by EHA or the service provider, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

Consultant contracts are approved by the President of the organization.

Subcontractors and Subrecipients

Subcontracts may be entered into to support work funded under various federal prime awards, subcontracts from Prime Contractors having federal awards or with private entities. Subrecipients are subcontractors that are specifically named in a federal award. The selection process for subcontracts and subrecipients are as follows:

Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to assess their capacity and their local relationships. Extensive review including CV's of principal investigators and their staff, administrative capacity, annual report and audit report reviews, indirect cost rate review, history of the institution

Costs are evaluated based on reasonableness, location of the work to be done, and the specific expertise needed for the funded work. Sub-Contracts are drafted by EHA, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

The prospective subcontractors reviewed among senior staff with a recommendation to the President for the decision.

Purchases

The Office manager is authorized to purchase supplies and equipment for the office and for computers for staff members. An office supply vendor is selected and reviewed annually. Selection is made based on competitive pricing for regularly purchased items, and quality of service. Purchases are made based on comparisons among online or physical catalogs.

Staff members may make purchases for items for their specific use, when the Office Manager cannot purchase them. Staff members must certify that the purchases are normal and reasonable costs.

epidemico

February 12, 2015

Andrew Huff, Ph.D., M.S.
Senior Research Scientist
EcoHealth Alliance

Dear Andrew,

Below and attached separately is information to support a revised license fee for our HealthMap data feed. Please let us know if you need any additional information. Thank you in advance for your support on this matter.

- Updated license fee: $240K annual fee
- Services included in license fee
  - 24/7, real-time data feed of all content and analyses from HealthMap (http://www.healthmap.org).
    - These data include event-based data scanned from over 50,000 publicly available websites including trade media, social media, and expert websites
    - Manual scanning of additional resources (e.g. blogs)
    - Data content includes all infectious disease outbreaks effecting both human and animal health
    - Data content is scanned, filtered, tagged and curated in 15+ languages, including English, Spanish, French, Russian, and Chinese, all translated into English
    - Data content is world-wide
    - Data content is updated hourly in real-time, 24/7
    - Data is curated by public health experts with capabilities in each of the supported languages
  - The feed is structured by specific disease entity, location, time stamp of the original publication, source data, category classification, outbreak rating by severity level, and any other relevant and significant details derived from the reporting source.
  - Feed can be delivered in an email or RSS or KML format.
  - Amazon cloud hosting fees included

- Separately attached: Contract agreement with DHS for same data license of HealthMap data feed. $240K annual fee

Best,

Robin Heffernan
President & COO
Epidemico, Inc.

COST SUMMARY

Cost Element	Base Period			Option I			Option II				
	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount		
Senior Research Scientist	$ 60.16	2080	$ 125,106	61.869153846	2080	$128,730.00	63.256000962	2080	$132,613		
Senior Software Developer (III)	$ 49.52	2080	$ 103,006	51.100280769	2080	$106,090.00	52.534495192	2080	$109,273		
Senior Data Scientist (III)	$ 50.96	2080	$ 106,000	52.490038462	2080	$109,180.00	53.965096615	2080	$112,455		
Data Scientist (II)	$ 43.75	1248	$ 54,600	45.06625	1248	$56,238.00	46.414375	1248	$57,925		
Research Scientist (II)	$ 21.63	2080	$ 45,006	22.283365385	2080	$46,350.00	22.952216346	2080	$47,741		
Research Assistant (I)	$ 19.23	1664	$ 32,000	19.80769231	1664	$32,960.00	20.40192308	1664	$33,949		
Senior Software Developer (III)	$ 49.52	2080	$ 103,000	51.004807692	2080	$106,090.00	52.534495192	2080	$109,273		
Software Developer (II)	$ 38.94	2080	$ 81,000	40.113576923	2080	$83,430.00	41.313389423	2080	$85,933		
TOTAL DIRECT LABOR		XX	$ 649,600		XX	$669,088		XX	$689,161	$	2,007,849
LABOR BURDEN	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount		
FRINGE BENEFITS	33.4%	$649,600.00	$ 216,966	33.45%	$669,088.00	$223,869.04	33.50%	$689,160.64	$230,868.81		
OVERHEAD			$ -	%	$	$	%	$	$		
TOTAL LABOR BURDEN			**$866,566.40**			**$892,897.04**			**$920,029.45**		**$2,679,493.79**
TOTAL MATL EQUIPMENT			$7,256.00			$0.00			$0.00		
TOTAL TRAVEL COSTS			$9,288.00			$5,759.76			$5,932.55		
TOTAL ALL OTHER DIRECT COSTS			$30,005.72			$30,545.39			$31,101.25		
TOTAL SUBCONTRACTOR COSTS			$984,295.53			$1,013,494.40			$1,043,569.23		
TOTAL DIRECT COSTS			**$1,897,411.65**			**$1,942,697.49**			**$2,000,632.49**		**$5,840,741.63**
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount		
G&A OR F&A	44.1%	$ 988,116	$ 435,759	44.1%	$ 1,004,203	$ 442,854	44.1%	$ 1,032,063	$ 455,140		
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$ -			$			$		
TOTAL COSTS			**$ 2,333,171**			**$ 2,385,551**			**$ 2,455,772**		
FEE/ PROFIT	Fee Rate	Fee Rate Applied to Total cost excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost excluding travel & FCCM	Total Amount		
FEE OR PROFIT	%	$	0	%	$	$	%	$	$		
TOTAL COST PLUS FEE			**$ 2,333,171**			**$ 2,385,551**			**$ 2,455,772**	**$**	**7,174,494**

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information
Computers	Apple	15-inch MacBook Air	$1,099	2	$2,198	Base Period	Unit price available on reseller website; ordering via Federal Supply Schedule 70 at www.apple.com/business/federal/gsa
Monitors	Apple	Thunderbolt Display	$999.00	3	$2,997	Base Period	Unit price per Apple.com/shop/store; Apple service package MC914LL/B Apple AppleCare for Thunderbolt Display 27-inch (Model A1316) Part # MC914LL/B
					$7,256		

Note:

Peripherals may be listed as a lump sum or individual items (e.g., $1,000 for 4 items that are each $250) but separately from the rest of the consumable group.

TRAVEL

Trip #:	1	Location:	Boston, MA (HealthMap and ProMED-mail)			Contract Period
Purpose:	Meet with HealthMap and ProMED-mail editors					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$400.00	$284.00	$516.00	$120.00	$1,320.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Boston	$120.00
Total:	$120.00

Trip #:	2	Location:	Carrboro, NC (Kitware)			Contract Period
Purpose:	Meet with Kitware database team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$442.00	$224.00	$194.00	$120.00	$980.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Carrboro	$120.00
Total:	$120.00

Trip #:	3	Location:	Clifton Park, NY (Kitware)			Contract Period
Purpose:	Meet with Kitware visualization team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2		$224.00	$232.00	$320.00	$776.00

Itemized Expenses for "Other"

Description	Amount
Tram fare	$200.00
Transportation in Clifton Park/Albany	$120.00
Total:	$320.00

Trip #:	4	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$354.00	$120.00	$1,258.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Total:	$120.00

Trip #:	5	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$354.00	$120.00	$1,258.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Total:	$120.00

Trip #:	6	Location:	TBD (Digital Disease Detection Conference)			Contract Period
Purpose:	Attend Digital Disease Detection Conference hosted by HealthMap					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
4	2	$1,000.00	$568.00	$2,008.00	$120.00	$3,696.00

Itemized Expenses for "Other"

Description	Amount
nsportation to/from airport and during confer	$120.00
Total:	$120.00

OTHER DIRECT COSTS

Description	Total Price	Contract Period	Additional Information
			List detailed description and additional information stating the need for the requirement and the method with which the total cost was calculated. Example: Twenty hours of laboratory usage is required to complete Task 4 and was calculated at a rate of $200 per hour. Laboratory hours were estimated based on experience with previous efforts of a similar size and scope
Cloud Processing Services	$17,094	Base Period	Commercial cloud processing for modeling, data analysis, software development, and web hosting. Estimate is based on our
Domain Registrar	$ 160	Base Period	Annual cost for domain name and security certificates
Cloud Application Services	$ 840	Base period	Cost of Google Apps Services and data hosting ($10 per user per month for google apps with unlimited storage)
Data Purchasing	$ 2,400	Base Period	Additional global datasets will be purchased based on priority diseases and regions identified in consultation with DTRA COR
Code Hosting	$2,400	Base Period	Estimate is based on the monthly cost of a github.com platinum plan
Books and reference materials	$711.72	Base Period	Estimate is a subscription to Safari Books Online ($46.81/month), plus 5 additional book purchases at $30 each
Software Licenses	$700	Base Period	Additional licenses for software such as text editors and office tools (estimated $100 per person)
Publication Fees	$4,500.00	Base Period	Calculated based on average publication fee for PLoS (Public Library of Science) journals (2 publications x $2,250 per
Meeting Costs	$500.00	Base Period	This will support two all-day meetings with the partners at the EcoHealth Alliance office in NY. It covers printing, copying.
Recruiting	$700	Base Period	2 job listings at $350 per 30-day listing on StackOverflow careers
	$30,006		

SUBCONTRACTORS

Company Nam	Total Price	Contract Period	Additional Information
Kitware	$503,580	Base Period	
Epidemico	$356,071.82	Base Period	
ISID	$124,643.43	Base Period	
Kitware	$518,687.69	Option I	
Epidemico	$366,423.97	Option I	
ISID	$128,382.74	Option I	
Kitware	$534,248.32	Option II	
Epidemico	$377,086.69	Option II	
ISID	$132,234.22	Option II	

TOTALS	
Epidemico =	**$1,099,582**
Kitware =	**$1,556,516**
ISID =	**$385,260.39**

COST SUMMARY

	Base Period			Option			Option I			Option II			Option III		
Cost Center	Base Hrs	Quantity Hrs	Total Amount	Base Hrs	Quantity Hrs	Total Amount	Base Hrs	Quantity Hrs	Total Amount	Base Hrs	Quantity Hrs	Total Amount	Base Hrs	Quantity Hrs	Total Amount
Senior Research Scientist	$ 87.50	2080	$ 182,000	$ 90,650.00	2080	$ 188,552,000	$	XX	$	$	XX	$	$	XX	$
Senior Software Developer III	$ 72.00	2080	$ 149,760	$ 74,520.00	2080	$ 155,001,600	$	XX	$	$	XX	$	$	XX	$
Senior Data Scientist III	$ 72.00	2080	$ 149,760	$ 74,520.00	2080	$ 155,001,600	$	XX	$	$	XX	$	$	XX	$
Project Manager III	$ 57.50	1248	$ 71,760	$ 59,685	2496	$ 148,977,600	$	XX	$	$	XX	$	$	XX	$
Research Scientist II	$ 57.50	1248	$ 71,760	$ 59,685.00	2496	$ 148,977,600	$	XX	$	$	XX	$	$	XX	$
Research Assistant	$ 35.00	1248	$ 43,680	$ 36,400.00	2496	$ 90,854,400	$	XX	$	$	XX	$	$	XX	$
Research Assistant	$ 35.00	1248	$ 43,680	$ 36,400.00	2496	$ 90,854,400		XX			XX			XX	
Senior Software Developer III	$ 59.52	2080	$ 123,802	$ 61,881.60	2080	$ 128,720,448	$	XX	$	$	XX	$	$	XX	$
Program Assistant III	$ 27.88	2080	$ 57,990	$22,752	2080	$47,327,616									
Software Developer III	$ 55.96	2080	$ 116,397	$ 111,936.92	2080	$ 232,836,288	$	XX	$	$	XX	$	$	XX	$
Software Developer III	$ 55.96	2080	$ 116,397	$ 111,936.92	2080	$ 232,836,288	$	XX	$		XX			XX	
DIRECT OBJECTIVE LABOR		XX	$ 823,000		XX	$ 882,298,000	$	XX	$		XX	$		XX	$
LABOR BURDEN	Rate	Burden Applied to	Total Amount	Rate	Burden Applied to	Total Amount	Rate	Burden Applied to	Total Amount	Rate	Burden Applied to	Total Amount	Rate	Burden Applied to	Total Amount
FRINGE BENEFITS	30.00%	$ 847,000.00	$ 888,000.00	30.00%	$882,298.00	$ 888,000.00	%	$	$ 264,911.40	%	$	$	%	$	$
OVERHEAD			$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL LABOR BURDEN			$ 1,187,760.00			$ 882,298.00			$			$			$
TRAVEL			$			$			$			$			$
TRAVEL DOMESTIC			$ 5,250.00			$ 10,500.00			$			$			$
TRAVEL ALLOWANCE			$ 6,562.50			$ 30,000.00			$			$			$
TRAVEL SUBCONTRACTORS			$ 650,208.71			$ 550,344.00			$			$			$
DIRECT OBJECTIVE COSTS			$ 1,850,781.21			$ 623,844.00			$			$			$
OVERHEAD	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A	45.25%	$ 837,000.00	$ 378,825.00	45.25%	$ 882,298.00	$ 399,200.00	%	$	$	%	$	$	%	$	$
FACILITY CAPITAL COST OF MONEY (FCCM)			$			$			$			$			$
TOTAL COSTS			$ 2,365,606.97			$ 2,462,990.55			$			$			$
FEE PROFIT	Fee Rate	Fee Rate Applied to Total Cost excluding Travel ALLOCA	Total Amount	Fee Rate	Fee Rate Applied to Total Cost excluding Travel ALLOCA	Total Amount	Fee Rate	Fee Rate Applied to Total Cost excluding Travel ALLOCA	Total Amount	Fee Rate	Fee Rate Applied to Total Cost excluding Travel ALLOCA	Total Amount	Fee Rate	Fee Rate Applied to Total Cost excluding Travel ALLOCA	Total Amount
TOTAL PROFIT	%	%	$	%	%	$	%	%	$	%	%	$	%	%	$
TOTAL COST PROFIT			$ 2,368,390.97			$ 2,462,990.55			$			$			$

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Price	Additional Information
					$0		

Note:
Consumables may be listed as items with individual items over $5,000. For those items that are over $5,000, list separately from the rest of your materials.

TRAVEL

Trip #:	1	Location:	Boston, MA (HealthMap and ProMED-mail)	Contract Period
Purpose:	Meet with HealthMap and ProMED-mail editors			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$800.00	$284.00	$1,000.00	$240.00	$2,324.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Boston	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	2	Location:	Carrboro, NC (Kitware)	Contract Period
Purpose:	Meet with Kitware database team			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$224.00	$500.00	$240.00	$1,964.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Carrboro	$120.00
Local transport NYC	$120.00
Total:	$240.00

Trip #:	3	Location:	Clifton Park, NY (Kitware)	Contract Period
Purpose:	Meet with Kitware visualization team			Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2		$224.00	$500.00	$720.00	$1,444.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$400.00
Transportation in Clifton Park/Albany	$120.00
Local transport NYC	$200.00
Total:	$720.00

Trip #:	4	Location:	Washington, DC Area (DTRA and BSVE)	Contract Period
Purpose:	Meet with DTRA and the BSVE team			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$1,000.00	$284.00	$1,000.00	$320.00	$2,604.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	5	Location:	Washington, DC Area (DTRA and BSVE)	Contract Period
Purpose:	Meet with DTRA and the BSVE team			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$1,000.00	$320.00	$2,104.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Local transport NYC	$200.00
Total:	$320.00

Trip #:	6	Location:	TBD (Digital Disease Detection Conference)	Contract Period
Purpose:	Attend Digital Disease Detection Conference hosted by HealthMap			Option 1

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
4	2	$1,000.00	$568.00	$3,000.00	$320.00	$4,888.00

Itemized Expenses for "Other"

Description	Amount
nsportation to/from airport and during confer	$120.00
Local transport NYC	$200.00

		Total:	$320.00

OTHER DIRECT COSTS

Description	Total Price	Price Unit	Additional Information
Laboratory Testing	Not Applicable		Test descriptions and associated information can be found in the Test Menu section. Laboratory tests are ordered by the healthcare provider who will be responsible for collecting specimens and reviewing results. Laboratory fees are estimated based on expected employer-sponsored health insurance coverage. Expected Tests: Complete Blood Count, Comprehensive Metabolic Panel, Lipid Panel, Urinalysis, Urine Drug Screen, Thyroid Stimulating Hormone, Hemoglobin A1c, Prostate-Specific Antigen, Vitamin D, Ferritin, Iron and Transferrin Saturation, Vitamin B12, Folate, Hepatitis B Surface Antigen, Hepatitis C Antibody, Human Immunodeficiency Virus 1 and 2 Antibodies, Rapid Plasma Reagin, Quantiferon-TB Gold, Chlamydia trachomatis and Neisseria gonorrhoeae Nucleic Acid Amplification Test, Cervical Cytology, Human Papillomavirus DNA, Prostate-Specific Antigen, Urine Pregnancy Test, Urine Cotinine, Urine Drug Screen, Hepatitis A Antibody, Hepatitis B Surface Antibody, Hepatitis B Core Antibody, Measles Immunity, Mumps Immunity, Rubella Immunity, Varicella Immunity, Tetanus Immunity, Diphtheria Immunity, Pertussis Immunity, Polio Immunity, Meningococcal Immunity, Hepatitis A Vaccine, Hepatitis B Vaccine, Measles-Mumps-Rubella Vaccine, Varicella Vaccine, Tetanus-Diphtheria-Pertussis Vaccine, Meningococcal Vaccine, Human Papillomavirus Vaccine, Influenza Vaccine, Pneumococcal Vaccine, Zoster Vaccine	
Electronic Processing Service Domain Registration	$ 1,200.00	Base Period	Commercial online processing of medical data, analysis, and storage. Estimated based on expected annual volume of 1,200 tests. Annual cost for domain name and security certificates.
Cloud Application Service	$ 600.00	Base Period	Cloud hosting application service and database hosting service application provider google apps with unlimited storage.
Data Processing	$ 2,400.00	Base Period	Additional global data analysis and processing services for regions identified as non-compliant with DORA or GDPR
Code Hosting	$ 2,400.00	Base Period	Estimated based on the monthly cost of a dedicated platform plan.
Background Investigation Services	$ 1,200.00	Base Period	Estimated $75 per employee. Data Bank Online (DBO) monthly plus $3 additional background investigation check.
Software Licenses	$ 1,000.00	Base Period	Additional licenses for software tools required for data analysis and visualization. Estimated $100 per license.
Publication Fees	$ 1,500.00	Base Period	Estimated based on average publication fee for Public Health Reports. Public Health Reports charges $2,500 per publication.
Vendor Costs	$ 5,000.00	Base Period	Hospital support for all laboratory testing activities. The Public Health Laboratory in New Haven County processing additional tests, including Vitamin D and Iron and Transferrin Saturation supplies and reagents.
Recruiting	$ 1,000.00	Base Period	Cost for hiring a new Senior Laboratory Technician to perform complex tests.
Electronic Processing Service Domain Registration	$ 1,200.00	Option Year 1	Commercial online processing of medical data, analysis, and storage. Estimated based on expected annual volume of 1,200 tests. Annual cost for domain name and security certificates.
Cloud Application Service	$ 600.00	Option Year 1	Cloud hosting application service and database hosting service application provider google apps with unlimited storage.
Data Processing	$ 2,400.00	Option Year 1	Additional global data analysis and processing services for regions identified as non-compliant with DORA or GDPR
Code Hosting	$ 2,400.00	Option Year 1	Estimated based on the monthly cost of a dedicated platform plan.
Background Investigation Services	$ 1,200.00	Option Year 1	Estimated $75 per employee. Data Bank Online (DBO) monthly plus $3 additional background investigation check.
Software Licenses	$ 1,000.00	Option Year 1	Additional licenses for software tools required for data analysis and visualization. Estimated $100 per license.
Publication Fees	$ 1,500.00	Option Year 1	Estimated based on average publication fee for Public Health Reports. Public Health Reports charges $2,500 per publication.
Vendor Costs	$ 5,000.00	Option Year 1	Hospital support for all laboratory testing activities. The Public Health Laboratory in New Haven County processing additional tests, including Vitamin D and Iron and Transferrin Saturation supplies and reagents.
	$ 30,700.00		

SUBCONTRACTORS

Company Name	Total Price	Contract Period	Additional Information
Kitware	$506,686.72	Base Period	
ISID	$124,521.99	Base Period	
Kitware	$521,887.33	Option I	
ISID	$128,257.65	Option I	

	Base Period			Option I								
Cost Element	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount
Labor Category & Title							$	XX	$	$	XX	$
Dr. . Bownsle n	$77.26	710	$54,847.50	$79.57	710	$56,492.93	$	XX	$	$	XX	$
Clark Freifeld , Senior Software Programmer	65.00	710	$39,050.00	$66.95	710	$40,221.50	$	XX	$	$	XX	$
Hanoic Rodriguez Software Programmer	37.55	1710	$64,210.50	$38.68	1710	$66,136.82	$	XX	$	$	XX	$
Kate O Brien, Front-end Software Developer	32.19	1610	$51,825.90	$33.16	1610	$53,380.68						
Chi Rahi, Project Manager	28.51	1715	$50,008.65	$29.46	1715	$52,127.64						
Carrie Preece, Data Curator	28.51	1710	$50,462.10	$29.46	1710	$51,975.66	$	XX	$	$	XX	$
TOTAL DIRECT LABOR		8165	$311,005.65		8165	$320,335.82		XX	$		XX	$
LABOR BURDEN	Rate	Rate Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount	Rate	Labor Burden Applied to	Total Amount
FRINGE BENEFITS	0.27	$311,005.65	$83,971.53	0.27	$320,335.82	$86,490.67	%	$	$	%	$	$
TOTAL LABOR BURDEN			$394,977.18			$ 406,826.49			$			$
TOTAL MATERIEL/EQUIPMENT			$0.00			$0.00			$			$
TOTAL TRAVEL COSTS			$3,646.00			$3,757.44			$			$
TOTAL ALL OTHER DIRECT COSTS			$240,000.00			$240,000.00			$			$
TOTAL SUBCONTRACTOR COSTS			$0.00			$ -			$			$
TOTAL DIRECT COSTS			$638,625.18			$650,583.93			$			$
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A AND OVERHEAD	0.5	$638,625.18	$319,312.59	$0.50	$650,583.93	$325,291.97	%	$	$	%	$	$
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$			$			$			$
TOTAL COSTS			$957,937.77			$975,875.90			$			$
FEE/PROFIT	Fee Rate	Fee Rate Applied to (total cost excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount
FEE OR PROFIT	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$			$			$			$

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (GeoHealth Trip)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$300.00	$284.00	$600.00	$240.00	$1,824.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and HSVI)		Contract Period	
Purpose:	Meet with DTRA and the BSVI team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$300.00	$284.00	$600.00	$240.00	$1,824.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$300.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
						$0.00	

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
HealthMap License Fee	$240,000	Base Period	HealthMap data license fee
HealthMap License Fee	$240,000	Option Year 1	HealthMap data license fee

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

	Base Period			Option I			Option II		
Cost Element	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount
Labor Category & Title									
Dr. J. Bravenstein	$15.25	710	$62,842.50	$39.57	710	$86,492.93	81.92	710	$58,183.71
Clark Penfield., Senior Software Programmer	22.00	710	$39,036.00	$26.65	710	$40,221.50	58.35	710	$41,428.15
Harold Reisgraez. Software Programmer	37.55	1710	$64,210.50	$38.68	1710	$66,130.82	39.84	1710	$68,120.92
Kate O'Brien., Front-end Software Developer	32.19	1610	$51,825.90	$33.16	1610	$53,380.68	34.15	1610	$54,982.10
Chi Bahls, Project Manager	29.51	1715	$50,009.65	$30.40	1715	$52,127.94	31.31	1715	$53,691.78
Carrie Pierce, Data Curator	29.51	1710	$50,462.10	$30.40	1710	$51,975.96	31.31	1710	$53,535.24
TOTAL DIRECT LABOR		8165	$311,005.65		8165	$320,335.82		8165	$329,945.89
LABOR BURDEN	Rate		Total Amount	Rate	Dir Burden Applied to	Total Amount	Rate	Dir Burden Applied to	Total Amount
FRINGE BENEFITS	%	$	$	%	$	$	%	$	$
OVERHEAD	%	$	$	%	$	$	%	$	$
TOTAL LABOR BURDEN			$311,005.65			$320,335.82			$329,945.89
TOTAL MATL EQUIPMENT			$0.00			$0.00			
TOTAL TRAVEL COSTS			$2,606.00			$2,776.88			$2,860.19
TOTAL ALL OTHER DIRECT COSTS			$10,000.00			10000			10000
TOTAL SUBCONTRACTOR COSTS			$0.00			0			$
TOTAL DIRECT COSTS			$323,701.65			$333,112.70			$342,806.08
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A OR F&A	10.00%	$323,701.65	$32,370.17	10.00%	$333,112.70	$33,311.27	0.1	342,806.08	$34,280.61
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$			$			$
TOTAL COSTS			$356,071.82			$366,423.97			$377,086.69
FEE PROFIT	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount
FEE OR PROFIT	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$			$			$

MATERIALS/EQUIPMENT						
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Add Final Price to Invoice

Note:
Consumables may be listed as a lump sum if miscellaneous items are $2,500. For those items that are over $2,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (TreoHealth A Turnkey)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$480.00	$284.00	$534.00	$120.00	$1,338.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and BSVE)		Contract Period	
Purpose:	Meet with DTRA and the BSVE team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$600.00	$284.00	$354.00	$120.00	$1,358.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
							$0.00

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
HealthMap License Fee	$10,000	Base Period	HealthMap data license fee
HealthMap License Fee	$10,000	Option Year I	HealthMap data license fee
HealthMap License Fee	$10,000	Option Year II	HealthMap data license fee

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

EPIDEMICO INC
266 NEWBURY STREET
2
BOSTON, MA 02116-0000
617-938-0252

8/29/2014

PAY TO THE ORDER OF CHI BAHK (b)(6)

NET $1,721.18

ONE THOUSAND SEVEN HUNDRED TWENTY-ONE & 18/100** **DOLLARS**

Transaction Type	Calculation Method	Amount
Direct Deposit	Balance	$1,721.18

CHECK DATE 8/29/2014 **PERIOD START** 8/16/2014 **PERIOD END** 8/31/2014 **NET PAY** $1,721.18

SSN ***-**-1937 **FED ALLOWANCES** 3 **MAALLOWANCES** 3

EARNINGS

Type	Hours	Rate	Current	YTD
SALARY			$2,291.67	$36,666.72
REIMB.			$78.10	$1,313.41
TOTALS			**$2,369.77**	**$37,980.13**

TAXES

Type	Current	YTD
FED WTH	$253.39	$4,059.34
FICA	$142.09	$2,273.34
MEDFICA	$33.23	$531.67
STATE-MA	$105.30	$1,582.62
TOTALS	**$534.01**	**$8,446.97**

DEDUCTIONS

Type	Current	YTD
SH401RT	$114.58	$916.64
TOTALS	**$114.58**	**$916.64**

OTHER PAY INFORMATION FOR PAY PERIOD

Type	Current	YTD

TOTALS

BENEFIT INFORMATION FOR PAY PERIOD

Benefit Type	Used This Period	Earned This Period	Closing Balance	Earned YTD	Used YTD

EPIDEMICO INC
266 NEWBURY STREET
2
BOSTON, MA 02116-0000
617-938-0252

8/29/2014

PAY TO THE ORDER OF JOHN BROWNSTEIN
(b)(6)

NET $25,000.00

TWENTY-FIVE THOUSAND & 00/100********** **DOLLARS**

CHECK DATE 8/29/2014 **PERIOD START** 8/16/2014 **PERIOD END** 8/31/2014 **NET PAY** $25,000.00

SSN ***-**-5136 **FED ALLOWANCES** **ALLOWANCES**

EARNINGS

Type	Hours	Rate	Current	YTD
1099$$	86.67		$25,000.00	$200,000.00
TOTALS			**$25,000.00**	**$200,000.00**

TAXES

Type	Current	YTD
TOTALS	**$.00**	**$.00**

DEDUCTIONS

Type	Current	YTD
TOTALS	**$.00**	**$.00**

OTHER PAY INFORMATION FOR PAY PERIOD

Type	Current	YTD

TOTALS

BENEFIT INFORMATION FOR PAY PERIOD

Benefit Type	Used This Period	Earned This Period	Closing Balance	Earned YTD	Used YTD

EPIDEMICO INC
266 NEWBURY STREET
2
BOSTON, MA 02116-0000
617-938-0252

8/29/2014

PAY TO THE ORDER OF CLARK FREIFELD
(b)(6)

NET $9,750.55

NINE THOUSAND SEVEN HUNDRED FIFTY & 55/100**** **DOLLARS**

CHECK DATE 8/29/2014 **PERIOD START** 8/16/2014 **PERIOD END** 8/31/2014 **NET PAY** $9,750.55

SSN ***-**-8467 **FED ALLOWANCES** 0 **MAALLOWANCES** 0

EARNINGS

Type	Hours	Rate	Current	YTD
SALARY			$25,000.00	$195,000.00
BONUS$			$.00	$50,000.00
REIMB.			$.00	$248.60
OTHER $			$.00	$5,000.00
TOTALS			**$25,000.00**	**$250,248.60**

TAXES

Type	Current	YTD
FED WTH	$6,056.95	$69,070.85
FICA	$.00	$7,254.00
MEDFICA	$587.50	$4,075.00
STATE-MA	$1,105.00	$12,710.24
TOTALS	**$7,749.45**	**$93,110.09**

DEDUCTIONS

Type	Current	YTD
SH 401K	$3,750.00	$3,750.00
SH401RT	$3,750.00	$3,750.00
TOTALS	**$7,500.00**	**$7,500.00**

OTHER PAY INFORMATION FOR PAY PERIOD

Type	Current	YTD

TOTALS

BENEFIT INFORMATION FOR PAY PERIOD

Benefit Type	Used This Period	Earned This Period	Closing Balance	Earned YTD	Used YTD

EPIDEMICO INC
266 NEWBURY STREET
2
BOSTON, MA 02116-0000
617-938-0252

8/29/2014

PAY TO THE ORDER OF KATELYNN O'BRIEN (b)(6)

NET $4,109.43

FOUR THOUSAND ONE HUNDRED NINE & 43/100****** **DOLLARS**

CHECK DATE 8/29/2014 **PERIOD START** 8/16/2014 **PERIOD END** 8/31/2014 **NET PAY** $4,109.43

SSN ***-**-1935 **FED ALLOWANCES** 1 **MA ALLOWANCES** 1

EARNINGS

Type	Hours	Rate	Current	YTD
SALARY			$5,833.33	$32,222.21
TOTALS			**$5,833.33**	**$32,222.21**

TAXES

Type	Current	YTD
FED WTH	$983.85	$5,748.25
FICA	$361.67	$1,997.78
MEDFICA	$84.58	$467.22
STATE-MA	$293.80	$1,523.89
TOTALS	**$1,723.90**	**$9,737.14**

DEDUCTIONS

Type	Current	YTD
TOTALS	**$.00**	**$.00**

OTHER PAY INFORMATION FOR PAY PERIOD

Type	Current	YTD

TOTALS

BENEFIT INFORMATION FOR PAY PERIOD

Benefit Type	Used This Period	Earned This Period	Closing Balance	Earned YTD	Used YTD

EPIDEMICO INC
266 NEWBURY STREET
2
BOSTON, MA 02116-0000
617-938-0252

8/29/2014

PAY TO THE ORDER OF HAROLD RODRIGUEZ
(b)(6)

NET $725.78

SEVEN HUNDRED TWENTY-FIVE & 78/100******** **DOLLARS**

Transaction Type	Calculation Method	Amount
Direct Deposit	Balance	$725.78

CHECK DATE 8/29/2014 **PERIOD START** 8/16/2014 **PERIOD END** 8/31/2014 **NET PAY** $725.78

SSN ***-**-0528 **FED ALLOWANCES** 0 **MA ALLOWANCES** 0

EARNINGS

Type	Hours	Rate	Current	YTD
SALARY			$3,125.00	$48,541.69
REIMB.			$150.00	$798.47

TAXES

Type	Current	YTD
FED WTH	$585.16	$9,001.48
FICA	$193.75	$3,009.58
MEDFICA	$45.31	$703.85
STATE-MA	$162.50	$2,422.84

DEDUCTIONS

Type	Current	YTD
SH401RT	$1,562.50	$12,500.00

TOTALS			**$3,275.00**	**$49,340.16**	**TOTALS**	**$986.72**	**$15,137.75**	**TOTALS**	**$1,562.50**	**$12,500.00**

OTHER PAY INFORMATION FOR PAY PERIOD

Type	Current	YTD

TOTALS

BENEFIT INFORMATION FOR PAY PERIOD

Benefit Type	Used This Period	Earned This Period	Closing Balance	Earned YTD	Used YTD

epidemico

January 6, 2015

Zach Gold
EcoHealth Alliance
460 West 34th Street
17th floor New York, NY 10001

Zach,

Epidemico has developed proprietary software and operates HealthMap databases, websites, algorithms, database architectures and news sites (the "HealthMap System") which collect, aggregate, analyze and disseminate information relating to world-wide infectious disease outbreaks and health-related incidents (the "Information"). The software is available for license where licensee has rights to use the platform and receive real time data feeds.

Should you need any further assistance, please do not hesitate to contact me, at kelly@epidemico.com or +1(617) 938-0252.

Sincerely,

Kelly Wahlberg
Chief Financial Officer
Epidemico, Inc.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

CONSOLIDATED FINANCIAL STATEMENTS, AUDITOR'S REPORTS AND SCHEDULE RELATED TO OFFICE OF MANAGEMENT AND BUDGET CIRCULAR A-133

JUNE 30, 2013

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

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ECOHEALTH ALLIANCE, INC.
AND
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INTERNATIONAL, INC.

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LOEB & TROPER LLP

Independent Auditor's Report on Financial Statements and Supplementary Information

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., which comprise the consolidated balance sheet as of June 30, 2013, and the related consolidated statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the consolidated financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

655 Third Avenue, 12th Floor, New York, NY 10017
(212) 867-4000 / Fax (212) 867-9810 / *www.loebandtroper.com*

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. as of June 30, 2013, and changes in their net assets and their cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Supplementary Information

Our audit was conducted for the purpose of forming an opinion on the financial statements as a whole. The accompanying schedule of expenditures of federal awards, as required by Office of Management and Budget Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*, is presented for purposes of additional analysis and is not a required part of the financial statements. The accompanying schedule of expenditures of federal awards is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the accompanying schedule of expenditures of federal awards is fairly stated, in all material respects, in relation to the financial statements as a whole.

Report on Summarized Comparative Information

We have previously audited EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s June 30, 2012 financial statements, and we expressed an unmodified audit opinion on those audited financial statements in our report dated January 31, 2013. In our opinion, the summarized comparative information presented herein as of and for the year ended June 30, 2012 is consistent, in all material respects, with the audited financial statements from which it has been derived.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated December 2, 2013 on our consideration of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting and on our tests of their compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting and compliance.

Loeb & Troper LLP

December 2, 2013, except for the schedule of expenditures of federal awards, as to which the date is February 14, 2014

EXHIBIT A

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

CONSOLIDATED BALANCE SHEET

JUNE 30, 2013 AND 2012

	2013	2012
ASSETS		
Cash and cash equivalents	$ 1,114,233	$ 1,527,312
Investments (Note 3)	1,845,184	2,607,681
Contributions receivable (Note 4)	247,206	385,524
Government contracts receivable - current	1,644,860	637,600
Other receivable		988
Prepaid expenses	63,305	23,381
Security deposits	33,333	33,333
Fixed assets - net (Note 5)	95,733	146,119
Total assets	$ 5,043,854	$ 5,361,938
LIABILITIES AND NET ASSETS		
Liabilities		
Accounts payable and accrued expenses	$ 2,329,374	$ 1,900,734
Net assets (Exhibit B)		
Unrestricted	2,396,635	1,987,408
Temporarily restricted (Note 7)	317,845	473,796
Permanently restricted (Notes 7 and 11)		1,000,000
Total net assets	2,714,480	3,461,204
Total liabilities and net assets	$ 5,043,854	$ 5,361,938

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

EXHIBIT B

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

	2013				
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	2012
Operating revenues and other support					
Government contracts and grants	$ 7,057,581			$ 7,057,581	$ 5,834,820
Foundations - contributions	3,000	$ 187,015		190,015	505,468
Corporations - contributions (including in-kind contributions of $769,551 in 2013) (Note 9)	905,010	10,999		916,009	935,210
Bequests	77,681	31,273		108,954	409,928
Individuals - contributions	355,064	92,000		447,064	499,415
Special events	355,945			355,945	185,590
Other revenues	91,821	9,948		101,769	65,346
Net assets released from restrictions (Note 7)	487,186	(487,186)			
Total operating revenues and other support	9,333,288	(155,951)		9,177,337	8,435,777

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ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

	2013				
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	2012
Expenses (Exhibit C)					
Program service					
Research and education	$ 7,019,042			$ 7,019,042	$ 6,894,466
Supporting services					
Management and general	658,174			658,174	690,163
Fund raising	1,439,960			1,439,960	871,644
Direct costs of special events	99,388			99,388	92,458
Total supporting services	2,197,522			2,197,522	1,654,265
Total expenses	9,216,564			9,216,564	8,548,731
Operating gain (loss)	116,724	$ (155,951)		(39,227)	(112,954)
Nonoperating activities					
Investment income (Note 3)	292,503			292,503	116,869
Disposition of restricted funds (Note 11)			$ (1,000,000)	(1,000,000)	(1,872,785)
Change in net assets (Exhibit D)	409,227	(155,951)	(1,000,000)	(746,724)	(1,868,870)
Net assets - beginning of year	1,987,408	473,796	1,000,000	3,461,204	5,330,074
Net assets - end of year (Exhibit A)	$ 2,396,635	$ 317,845	$ -	$ 2,714,480	$ 3,461,204

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC. AND
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INTERNATIONAL, INC.

EXHIBIT C

CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

		Supporting Services				Total	
	Research and Education	Management and General	Fund Raising	Direct Costs of Special Events	Total	2013	2012
Salaries	$ 1,953,635	$ 311,161	$ 412,242		$ 723,403	$ 2,677,038	$ 2,338,790
Payroll taxes and employee benefits	638,611	100,009	133,100		233,109	871,720	723,024
Total salaries and related expenses	2,592,246	411,170	545,342		956,512	3,548,758	3,061,814
Professional fees (Note 9)	76,071	61,266	763,659		824,925	900,996	864,292
Subcontracts	3,006,187					3,006,187	2,787,426
Grants to other organizations	128,084					128,084	256,213
Field costs	86,976					86,976	111,002
Meetings and conferences	164,656	8,295	33,050		41,345	206,001	148,047
Travel and entertainment	437,372	2,449	20,190		22,639	460,011	461,001
Occupancy (Note 8)	268,895	132,900	42,778		175,678	444,573	410,281
Printing	37,636	619	7,551		8,170	45,806	52,006
Postage	21,902	1,274	2,513		3,787	25,689	32,187
Supplies	22,872	6,033	3,124		9,157	32,029	28,908
Telephone	43,309	10,177	3,369		13,546	56,855	29,204
Dues and subscriptions	12,452	683	293		976	13,428	19,511
Depreciation and amortization	30,054	15,402	4,930		20,332	50,386	62,917
Catering and facility rental				$ 99,388	99,388	99,388	92,458
Information technology	90,330	7,613	13,161		20,774	111,104	130,219
Investment expenses		14,948			14,948	14,948	23,257
Miscellaneous		293			293	293	1,245
Total other than salaries and related expenses	4,426,796	261,952	894,618	99,388	1,255,958	5,682,754	5,510,174
Total expenses	7,019,042	673,122	1,439,960	99,388	2,212,470	9,231,512	8,571,988
Less expenses netted against investment income		(14,948)			(14,948)	(14,948)	(23,257)
Total expenses reported by function on the statement of activities (Exhibit B)	$ 7,019,042	$ 658,174	$ 1,439,960	$ 99,388	$ 2,197,522	$ 9,216,564	$ 8,548,731

See independent auditor's report.

The accompanying notes are an integral part of these statements.

EXHIBIT D

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

CONSOLIDATED STATEMENT OF CASH FLOWS

YEARS ENDED JUNE 30, 2013 AND 2012

	2013	2012
Cash flows from operating activities		
Change in net assets (Exhibit B)	$ (746,724)	$ (1,868,870)
Adjustments to reconcile change in net assets to net cash used by operating activities		
Depreciation and amortization	50,386	62,917
Realized and unrealized gains on investments	(240,537)	(27,183)
Disposition of endowment fund	1,000,000	
Decrease (increase) in assets		
Contributions receivable	138,318	(141,387)
Government contracts receivable	(1,007,260)	64,106
Other receivable	988	9,616
Prepaid expenses	(39,924)	32,313
Increase in liabilities		
Accounts payable and accrued expenses	428,640	462,750
Net cash used by operating activities	(416,113)	(1,405,738)
Cash flows from investing activities		
Proceeds from sale of investments	2,224,010	2,395,619
Purchase of investments	(1,220,976)	(599,162)
Disposition of long-term endowment	(1,000,000)	
Net cash provided by investing activities	3,034	1,796,457
Net change in cash and cash equivalents	(413,079)	390,719
Cash and cash equivalents - beginning of year	1,527,312	1,136,593
Cash and cash equivalents - end of year	$ 1,114,233	$ 1,527,312

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 1 - ORGANIZATION AND TAX STATUS

On June 22, 2010, Wildlife Trust, Inc. changed its name to EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. was incorporated on July 20, 2000 in the Commonwealth of Massachusetts. EcoHealth Alliance, Inc.'s mission is to integrate innovative science-based solutions and partnerships that increase capacity to achieve two interrelated goals: protecting global health by preventing the outbreak of emerging diseases and safeguarding ecosystems by promoting conservation.

EcoHealth Alliance, Inc. is funded primarily by contributions and government contracts and grants.

Wildlife Preservation Trust International, Inc. (WPTI) was incorporated on January 7, 1976 in the state of Pennsylvania. WPTI is a dormant corporation. In 2000, WPTI transferred the predominance of its assets to Wildlife Trust Inc., now known as EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. and WPTI are exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code and are related through common control.

EcoHealth Alliance, Inc. and WPTI are collectively referred to as "EHA."

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of accounting - The financial statements are prepared on the accrual basis of accounting.

Principles of consolidation - All material intercompany transactions and balances have been eliminated in the consolidation.

Use of estimates - The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

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ECOHEALTH ALLIANCE, INC.
AND
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INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Cash and cash equivalents - EHA considers highly liquid instruments purchased with original maturities of three months or less to be cash equivalents. EHA has periodically throughout the year maintained balances in various operating and money market accounts in excess of federally insured limits.

Investments - Investments are recorded at fair value. EHA invests in various investment securities. Investment securities are exposed to various risks such as interest rate, market and credit risks. Due to the level of risk associated with investment securities, it is at least reasonably possible that changes in the values of investment securities will occur in the near term, based upon the markets' fluctuations, and that such changes could materially affect EHA's financial statements.

Contributions receivable - Unconditional promises to give that are expected to be collected within one year are recorded at net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using risk-adjusted interest rates applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Conditional promises to give are not included as support until the conditions are subsequently met.

Government contracts receivable - Government contracts receivable are recorded when qualifying expenditures are incurred and EHA has a signed contract for services.

Allowance for doubtful accounts - EHA determines whether an allowance for uncollectibles should be provided for contributions and government contracts receivable. Such estimates are based on management's assessment of the aged basis of its contributions and other sources, current economic conditions and historical information. Contributions and government contracts receivable are written off against the allowance for doubtful accounts when all reasonable collection efforts have been exhausted.

Fixed assets - Fixed assets are recorded at cost and depreciated over their estimated useful lives using the straight-line method. Leasehold improvements are recorded at cost and are amortized over the shorter of the term of the lease or its estimated useful life using the straight-line method. Items with a cost in excess of $5,000 and an estimated useful life of greater than one year are capitalized.

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ECOHEALTH ALLIANCE, INC.
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INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Net assets - Unrestricted net assets include funds having no restriction as to use or purpose imposed by donors. Temporarily restricted net assets are those whose use has been limited by donors to a specific time period or purpose. Permanently restricted net assets have been restricted by donors to be maintained in perpetuity.

Revenues from government agencies - Revenues from government agencies are recognized when earned. Expense-based grants are recognized as allowable expenses are incurred. Performance-based grants are recognized as milestones are achieved.

Contributed services - Contributed services are recognized as revenue if the services create or enhance nonfinancial assets or require specialized skills, are provided by individuals possessing those skills, and typically need to be purchased if not provided by donation.

Contributions - Unconditional contributions, including promises to give cash and other assets, are reported at fair value at the date the contribution is received. Contributions are reported as either temporarily or permanently restricted support if they are received with donor stipulations that limit the use of the donated assets. When a donor restriction expires, that is, when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified as unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

In-kind donations - In-kind donations are recorded at fair value.

Functional allocation of expenses - The costs of providing EHA's programs and other activities have been summarized on a functional basis. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Rent expense - EHA leases space at various locations. All leases are operating leases. Rent expense is recognized on the first day of each month for the current month's rent. All leases are reflected on the straight-line basis.

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ECOHEALTH ALLIANCE, INC.
AND
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Grants to other organizations - EHA grants funds to charitable organizations for specific programs. Grants are recorded when approved by the EHA Board of Directors. Funds approved for payment are recorded as grants payable. As of June 30, 2013 and 2012, there were no outstanding grants payable.

Subcontracted services - Subcontracted services are recorded when services are incurred by the subcontractor. Advances to subcontractors are recorded as an asset. As of June 30, 2013 and 2012, there were no advances to subcontractors.

Measure of operations - EHA includes in its measure of operations all revenues and expenses that are an integral part of its program and supporting services and excludes investment income and disposition of restricted funds.

Prior-year summarized comparative information - The financial statements include certain prior-year summarized comparative information in total but not by net asset class. Such information does not include sufficient detail to constitute a presentation in conformity with accounting principles generally accepted in the United States of America. Accordingly, such information should be read in conjunction with the financial statements for the year ended June 30, 2012, from which the summarized information was derived.

Fair Value Measurements

Fair Value Measurements, ASC Topic 820, establishes a framework for measuring fair value. The framework provides a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are described below. Level 1 inputs to the valuation methodology are unadjusted quoted prices for identical assets or liabilities in active markets that EHA has the ability to access. Level 2 inputs to the valuation methodology include:

- Quoted prices for similar assets or liabilities in active markets;
- Quoted prices for identical or similar assets or liabilities in inactive markets;
- Inputs other than quoted prices that are observable for the asset or liability;
- Inputs that are derived principally from or corroborated by observable market data by correlation or other means.

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ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Fair Value Measurements (continued)

If the asset or liability has a specified (contractual) term, the Level 2 input must be observable for substantially the full term of the asset or liability. Level 3 inputs to the valuation methodology are unobservable and significant to the fair value measurement. The asset or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques used need to maximize the use of observable inputs and minimize the use of unobservable inputs.

The following is a description of the valuation methodology used for assets measured at fair value. There has been no change in the methodology used at June 30, 2013 as compared to 2012.

Cash equivalents - Valued at the closing price reported on the active market on which the individual securities are traded.

Government and government agency bonds, common stock, corporate bonds, U.S. Treasury bonds and notes, and exchange-traded funds (ETFs) - Valued at the closing price reported on the active market on which the individual securities are traded.

The method described above may produce a fair value calculation that may not be indicative of net realizable value or reflective of future fair values. Furthermore, while EHA believes its valuation method is appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

The assets at fair value as of June 30, 2013 and 2012 are set forth by level within the fair value hierarchy in Note 3.

Uncertainty in income taxes - EHA has determined that there are no material uncertain tax positions that require recognition or disclosure in the financial statements. Periods ending June 30, 2010 and subsequent remain subject to examination by applicable taxing authorities.

Subsequent events - Subsequent events have been evaluated through December 2, 2013, which is the date the financial statements were available to be issued.

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ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 3 - INVESTMENTS

	2013 (Level 1)	2012 (Level 1)
Cash equivalents	$ 30,067	$ 30,911
Bonds		
Corporate bonds	337,912	584,973
Government and government agency bonds	79,993	71,346
U.S. treasury bonds and notes	48,660	37,763
Common stock		
Basic materials	206,565	218,607
Conglomerates		98,165
Consumer goods	190,566	175,266
Financial	166,148	213,248
Healthcare	223,730	226,626
Industrials	63,540	30,713
Information technology	262,820	290,700
Services	229,156	264,284
Exchange-traded funds (ETFs) - equities	6,027	365,079
	$ 1,845,184	$ 2,607,681

Investment income consists of the following:

	2013	2012
Interest and dividends	$ 66,914	$ 112,943
Realized and unrealized gains on investments	240,537	27,183
Investment fees	(14,948)	(23,257)
	$ 292,503	$ 116,869

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ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 4 - CONTRIBUTIONS RECEIVABLE

Contributions receivable are recorded at their net realizable value. The contributions receivable are expected to be paid as follows:

2014	$ 207,206
2015	40,000
	$ 247,206

NOTE 5 - FIXED ASSETS

	2013	2012	Estimated Useful Lives
Office equipment	$ 47,507	$ 47,507	3 years
Furniture and fixtures	68,439	68,439	10 years
Leasehold improvements	472,824	472,824	10 years
	588,770	588,770	
Accumulated depreciation and amortization	(493,037)	(442,651)	
Net	$ 95,733	$ 146,119	

NOTE 6 - PENSION

EHA has a 403(b) defined contribution pension plan covering employees who meet age and length of service requirements. Pension expense was $119,053 and $107,477 for the years ended June 30, 2013 and 2012, respectively.

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ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 7 - TEMPORARILY AND PERMANENTLY RESTRICTED NET ASSETS

Temporarily restricted net assets are available for the following purposes:

	2013	2012
Aquatics programs		$ 5,000
Conservation medicine field activities	$ 277,480	
Ecohealth Alliance Partners	40,265	305,636
Predict and prevent programs		163,160
	$ 317,845	$ 473,796

Temporarily restricted net assets have been released from restrictions by satisfying the following purposes:

	2013	2012
Aquatics programs	$ 5,000	$
Conservation medicine field activities	53,655	13,337
Ecohealth Alliance Partners	265,371	272,579
Predict and prevent programs	163,160	370,403
	$ 487,186	$ 656,319

Permanently restricted net assets are restricted to investments to be held in perpetuity. The investment income is available for the following purpose:

	2013	2012
Elephant conservation	$ -	$ 1,000,000

-continued-

ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 8 - OCCUPANCY

In 2005, EHA entered into a ten-year and five-month lease for office space in New York. On September 24, 2013 the lease was extended until December 31, 2023. Rental expense for the years ended June 30, 2013 and 2012 was $264,036 and $243,834, respectively.

Minimum lease payments are as follows:

Year Ending June 30,	
2014	$ 299,800
2015	369,600
2016	369,600
2017	397,100
2018	424,600
Thereafter	2,500,300
	$ 4,361,000

NOTE 9 - IN-KIND DONATIONS

EHA received the following in-kind donations:

Legal fees	$ 38,661
Public relations	690,600
Research	40,290
	$ 769,551

NOTE 10 - CONTINGENCIES

EHA is subject to audits by funding sources. Management believes that the results of such audits, if any, will not have an adverse effect on the financial statements.

-continued-

ECOHEALTH ALLIANCE, INC.
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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 11 - DISPOSITION OF RESTRICTED FUNDS

In March 2013, EHA reached an agreement with the Wildlife Conservation Network on the disposition of a restricted fund: the Elephant Crisis Fund, (part of EcoHealth Alliance Partners) which had been held by EHA.

ECOHEALTH ALLIANCE, INC.
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SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

Federal Grantor/Pass-through Grantor/Program or Cluster Title	Federal CFDA Number	Pass-through Entity Identification Number	Federal Expenditures
Research and Development Cluster			
U.S. Department of Interior			
Fish and Wildlife Service			
Endangered Species Conservation - Recovery Implementation Funds	15.657		$ 74,491
Great Apes Conservation Fund	15.629		36,996
Total U.S. Department of Interior			111,487
National Science Foundation			
Biological Sciences	47.074		
Viral Pathogens			15,975
EcohealthNet			119,930
Kuming Workshop			9,020
Total National Science Foundation			144,925
U.S. Department of Defense			
Defense Threat Reduction Agency			
Biosurveillance Ecosystem Implementation	12.UNKNOWN		501,970
Total U.S. Department of Defense			501,970

- continued -

ECOHEALTH ALLIANCE, INC.
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INTERNATIONAL, INC.

SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

Federal Grantor/Pass-through Grantor/Program or Cluster Title	Federal CFDA Number	Pass-through Entity Identification Number	Federal Expenditures
Research and Development Cluster ***(continued)***			
U.S. Department of Health and Human Services			
National Institutes of Health			
Allergy, Immunology and Transplantation Research	93.855		$ 1,031,507
Biomedical Research and Research Training	93.859		
Pass-through from Arizona State University		12-850	107,264
Bushment Services	93.UNKNOWN		46,318
International Research and Research Training	93.989		496,791
The Ecology, Emergence and Pandemic Potential of Nipah Virus in Bangladesh	93.999		105,394
Total U.S. Department of Health and Human Services			1,787,274
United States Agency for International Development			
Global Viral Forecasting	98.UNKNOWN		
Pass-through from Global Viral Forecasting Incorporated		N/A	130,130
Emerging Pandemic Threat Program	98.UNKNOWN		
Pass-through from University of California-Davis		N/A	4,381,794
Total United States Agency for International Development			4,511,924
Total Research and Development Cluster			7,057,580
Total expenditures of federal awards			$ 7,057,580

See independent auditor's report.

The accompanying notes are an integral part of this schedule.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

NOTE 1 - BASIS OF PRESENTATION

The accompanying schedule of expenditures of federal awards (the "Schedule") includes the federal grant activity of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. under programs of the federal government for the year ended June 30, 2013. The information in this schedule is presented in accordance with the requirements of Office of Management and Budget (OMB) Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*. Because the Schedule presents only a selected portion of the operations of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., it is not intended to and does not present the financial position, changes in net assets or cash flows of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Expenditures reported on the Schedule are reported on the accrual basis of accounting. Such expenditures are recognized following the cost principles contained in OMB Circular A-122, *Cost Principles for Non-Profit Organizations*, wherein certain types of expenditures are not allowable or are limited as to reimbursement. Negative amounts shown on the Schedule represent adjustments or credits made in the normal course of business to amounts reported as expenditures in prior years. Pass-through entity identifying numbers are presented where available.

NOTE 3 - SUBRECIPIENTS

Of the federal expenditures presented in the Schedule, EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. provided federal awards to subrecipients as follows:

CFDA Number	Program Name	Amount Provided to Subrecipient
47.074	Biological Sciences	$ 97,109
93.855	Allergy, Immunology and Transplantation Research	616,816

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

NOTE 3 - SUBRECIPIENTS (continued)

CFDA Number	Program Name	Amount Provided to Subrecipient
93.859	Biomedical Research and Research Training	$ 17,240
93.989	International Research and Research Training	318,767
93.999	The Ecology, Emergence and Pandemic Potential of Nipah Virus in Bangladesh	27,144
93. UNKNOWN	Bushment Services	4,000
	Total	$ 1,081,076

LOEB & TROPER LLP

Independent Auditor's Report on
Internal Control Over Financial Reporting
and on Compliance and Other Matters
Based on an Audit of Financial Statements Performed
in Accordance with Government Auditing Standards

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., which comprise the balance sheet as of June 30, 2013, and the related statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the financial statements, and have issued our report thereon dated December 2, 2013.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control. Accordingly, we do not express an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected, on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

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Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s financial statements are free from material misstatement, we performed tests of their compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Purpose of This Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Loeb & Troper LLP

December 2, 2013

LOEB & TROPER LLP

Report on Compliance for Each Major Federal Program;
Report on Internal Control Over Compliance

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

Report on Compliance for Each Major Federal Program

We have audited EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance with the types of compliance requirements described in the OMB Circular A-133 Compliance Supplement that could have a direct and material effect on each of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs for the year ended June 30, 2013. EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs are identified in the summary of auditor's results section of the accompanying schedule of findings and questioned costs.

Management's Responsibility

Management is responsible for compliance with the requirements of laws, regulations, contracts, and grants applicable to their federal programs.

Auditor's Responsibility

Our responsibility is to express an opinion on compliance for each of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs based on our audit of the types of compliance requirements referred to above. We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and OMB Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*. Those standards and OMB Circular A-133 require that we plan and perform the audit to obtain reasonable assurance about whether noncompliance with the types of compliance requirements referred to above that could have a direct and material effect on a major federal program occurred. An audit includes examining, on a test basis, evidence about EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance with those requirements and performing such other procedures as we considered necessary in the circumstances.

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We believe that our audit provides a reasonable basis for our opinion on compliance for each major federal program. However, our audit does not provide a legal determination of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance.

Opinion on Each Major Federal Program

In our opinion, EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. complied, in all material respects, with the types of compliance requirements referred to above that could have a direct and material effect on each of their major federal programs for the year ended June 30, 2013.

Report on Internal Control Over Compliance

Management of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. is responsible for establishing and maintaining effective internal control over compliance with the types of compliance requirements referred to above. In planning and performing our audit of compliance, we considered EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over compliance with the types of requirements that could have a direct and material effect on each major federal program to determine the auditing procedures that are appropriate in the circumstances for the purpose of expressing an opinion on compliance for each major federal program and to test and report on internal control over compliance in accordance with OMB Circular A-133, but not for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, we do not express an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over compliance.

A deficiency in internal control over compliance exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A material weakness in internal control over compliance is a deficiency, or combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A significant deficiency in internal control over compliance is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance.

Our consideration of internal control over compliance was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies. We did not identify any deficiencies in internal control over compliance that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of OMB Circular A-133. Accordingly, this report is not suitable for any other purpose.

Loeb & Troper LLP

February 14, 2014

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

SCHEDULE OF FINDINGS AND QUESTIONED COSTS

YEAR ENDED JUNE 30, 2013

Section I - Summary of Auditor's Results

Financial Statements

Type of auditor's report issued:	Unmodified		
Internal control over financial reporting:			
Material weakness(es) identified?	____ yes	X no	
Significant deficiency(ies) identified?	____ yes	X none reported	
Noncompliance material to financial statements noted?	____ yes	X no	

Federal Awards

Internal control over major programs:			
Material weakness(es) identified?	____ yes	X no	
Significant deficiency(ies) identified?	____ yes	X none reported	
Type of auditor's report issued on compliance for major programs:	Unmodified		
Any audit findings disclosed that are required to be reported in accordance with Section 510(a) of Circular A-133?	____ yes	X no	

Identification of major program:

CFDA Number	Name of Federal Program or Cluster
Various	Research and Development Cluster

Dollar threshold used to distinguish between Type A and Type B programs:	$300,000	
Auditee qualified as low-risk auditee?	X yes	____ no

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

SCHEDULE OF FINDINGS AND QUESTIONED COSTS

YEAR ENDED JUNE 30, 2013

Section II - Financial Statement Findings

No matters were reported.

Section III - Federal Award Findings and Questioned Costs

No matters were reported.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

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ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

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(continued)

LOEB & TROPER LLP

Independent Auditor's Report on Financial Statements and Supplementary Information

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

Report on the Financial Statements

We have audited the accompanying consolidated financial statements of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., which comprise the consolidated balance sheet as of June 30, 2013, and the related consolidated statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the consolidated financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

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An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. as of June 30, 2013, and changes in their net assets and their cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Supplementary Information

Our audit was conducted for the purpose of forming an opinion on the financial statements as a whole. The accompanying schedule of expenditures of federal awards, as required by Office of Management and Budget Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*, is presented for purposes of additional analysis and is not a required part of the financial statements. The accompanying schedule of expenditures of federal awards is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the accompanying schedule of expenditures of federal awards is fairly stated, in all material respects, in relation to the financial statements as a whole.

Report on Summarized Comparative Information

We have previously audited EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s June 30, 2012 financial statements, and we expressed an unmodified audit opinion on those audited financial statements in our report dated January 31, 2013. In our opinion, the summarized comparative information presented herein as of and for the year ended June 30, 2012 is consistent, in all material respects, with the audited financial statements from which it has been derived.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated December 2, 2013 on our consideration of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting and on our tests of their compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting and compliance.

Loeb & Troper LLP

December 2, 2013, except for the schedule of expenditures of federal awards, as to which the date is February 14, 2014

EXHIBIT A

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

CONSOLIDATED BALANCE SHEET

JUNE 30, 2013 AND 2012

	2013	2012
ASSETS		
Cash and cash equivalents	$ 1,114,233	$ 1,527,312
Investments (Note 3)	1,845,184	2,607,681
Contributions receivable (Note 4)	247,206	385,524
Government contracts receivable - current	1,644,860	637,600
Other receivable		988
Prepaid expenses	63,305	23,381
Security deposits	33,333	33,333
Fixed assets - net (Note 5)	95,733	146,119
Total assets	$ 5,043,854	$ 5,361,938
LIABILITIES AND NET ASSETS		
Liabilities		
Accounts payable and accrued expenses	$ 2,329,374	$ 1,900,734
Net assets (Exhibit B)		
Unrestricted	2,396,635	1,987,408
Temporarily restricted (Note 7)	317,845	473,796
Permanently restricted (Notes 7 and 11)		1,000,000
Total net assets	2,714,480	3,461,204
Total liabilities and net assets	$ 5,043,854	$ 5,361,938

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

EXHIBIT B

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

	2013				
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	2012
Operating revenues and other support					
Government contracts and grants	$ 7,057,581			$ 7,057,581	$ 5,834,820
Foundations - contributions	3,000	$ 187,015		190,015	505,468
Corporations - contributions (including in-kind contributions of $769,551 in 2013) (Note 9)	905,010	10,999		916,009	935,210
Bequests	77,681	31,273		108,954	409,928
Individuals - contributions	355,064	92,000		447,064	499,415
Special events	355,945			355,945	185,590
Other revenues	91,821	9,948		101,769	65,346
Net assets released from restrictions (Note 7)	487,186	(487,186)			
Total operating revenues and other support	9,333,288	(155,951)		9,177,337	8,435,777

-continued-

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

CONSOLIDATED STATEMENT OF ACTIVITIES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

	2013				
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	2012
Expenses (Exhibit C)					
Program service					
Research and education	$ 7,019,042			$ 7,019,042	$ 6,894,466
Supporting services					
Management and general	658,174			658,174	690,163
Fund raising	1,439,960			1,439,960	871,644
Direct costs of special events	99,388			99,388	92,458
Total supporting services	2,197,522			2,197,522	1,654,265
Total expenses	9,216,564			9,216,564	8,548,731
Operating gain (loss)	116,724	$ (155,951)		(39,227)	(112,954)
Nonoperating activities					
Investment income (Note 3)	292,503			292,503	116,869
Disposition of restricted funds (Note 11)			$ (1,000,000)	(1,000,000)	(1,872,785)
Change in net assets (Exhibit D)	409,227	(155,951)	(1,000,000)	(746,724)	(1,868,870)
Net assets - beginning of year	1,987,408	473,796	1,000,000	3,461,204	5,330,074
Net assets - end of year (Exhibit A)	$ 2,396,635	$ 317,845	$ -	$ 2,714,480	$ 3,461,204

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC. AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

EXHIBIT C

CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES

YEAR ENDED JUNE 30, 2013
(With Summarized Financial Information for the Year Ended June 30, 2012)

		Supporting Services				Total	
	Research and Education	Management and General	Fund Raising	Direct Costs of Special Events	Total	2013	2012
Salaries	$ 1,953,635	$ 311,161	$ 412,242		$ 723,403	$ 2,677,038	$ 2,338,790
Payroll taxes and employee benefits	638,611	100,009	133,100		233,109	871,720	723,024
Total salaries and related expenses	2,592,246	411,170	545,342		956,512	3,548,758	3,061,814
Professional fees (Note 9)	76,071	61,266	763,659		824,925	900,996	864,292
Subcontracts	3,006,187					3,006,187	2,787,426
Grants to other organizations	128,084					128,084	256,213
Field costs	86,976					86,976	111,002
Meetings and conferences	164,656	8,295	33,050		41,345	206,001	148,047
Travel and entertainment	437,372	2,449	20,190		22,639	460,011	461,001
Occupancy (Note 8)	268,895	132,900	42,778		175,678	444,573	410,281
Printing	37,636	619	7,551		8,170	45,806	52,006
Postage	21,902	1,274	2,513		3,787	25,689	32,187
Supplies	22,872	6,033	3,124		9,157	32,029	28,908
Telephone	43,309	10,177	3,369		13,546	56,855	29,204
Dues and subscriptions	12,452	683	293		976	13,428	19,511
Depreciation and amortization	30,054	15,402	4,930		20,332	50,386	62,917
Catering and facility rental				$ 99,388	99,388	99,388	92,458
Information technology	90,330	7,613	13,161		20,774	111,104	130,219
Investment expenses		14,948			14,948	14,948	23,257
Miscellaneous		293			293	293	1,245
Total other than salaries and related expenses	4,426,796	261,952	894,618	99,388	1,255,958	5,682,754	5,510,174
Total expenses	7,019,042	673,122	1,439,960	99,388	2,212,470	9,231,512	8,571,988
Less expenses netted against investment income		(14,948)			(14,948)	(14,948)	(23,257)
Total expenses reported by function on the statement of activities (Exhibit B)	$ 7,019,042	$ 658,174	$ 1,439,960	$ 99,388	$ 2,197,522	$ 9,216,564	$ 8,548,731

See independent auditor's report.

The accompanying notes are an integral part of these statements.

EXHIBIT D

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

CONSOLIDATED STATEMENT OF CASH FLOWS

YEARS ENDED JUNE 30, 2013 AND 2012

	2013	2012
Cash flows from operating activities		
Change in net assets (Exhibit B)	$ (746,724)	$ (1,868,870)
Adjustments to reconcile change in net assets to net cash used by operating activities		
Depreciation and amortization	50,386	62,917
Realized and unrealized gains on investments	(240,537)	(27,183)
Disposition of endowment fund	1,000,000	
Decrease (increase) in assets		
Contributions receivable	138,318	(141,387)
Government contracts receivable	(1,007,260)	64,106
Other receivable	988	9,616
Prepaid expenses	(39,924)	32,313
Increase in liabilities		
Accounts payable and accrued expenses	428,640	462,750
Net cash used by operating activities	(416,113)	(1,405,738)
Cash flows from investing activities		
Proceeds from sale of investments	2,224,010	2,395,619
Purchase of investments	(1,220,976)	(599,162)
Disposition of long-term endowment	(1,000,000)	
Net cash provided by investing activities	3,034	1,796,457
Net change in cash and cash equivalents	(413,079)	390,719
Cash and cash equivalents - beginning of year	1,527,312	1,136,593
Cash and cash equivalents - end of year	$ 1,114,233	$ 1,527,312

See independent auditor's report.

The accompanying notes are an integral part of these statements.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 1 - ORGANIZATION AND TAX STATUS

On June 22, 2010, Wildlife Trust, Inc. changed its name to EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. was incorporated on July 20, 2000 in the Commonwealth of Massachusetts. EcoHealth Alliance, Inc.'s mission is to integrate innovative science-based solutions and partnerships that increase capacity to achieve two interrelated goals: protecting global health by preventing the outbreak of emerging diseases and safeguarding ecosystems by promoting conservation.

EcoHealth Alliance, Inc. is funded primarily by contributions and government contracts and grants.

Wildlife Preservation Trust International, Inc. (WPTI) was incorporated on January 7, 1976 in the state of Pennsylvania. WPTI is a dormant corporation. In 2000, WPTI transferred the predominance of its assets to Wildlife Trust Inc., now known as EcoHealth Alliance, Inc.

EcoHealth Alliance, Inc. and WPTI are exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code and are related through common control.

EcoHealth Alliance, Inc. and WPTI are collectively referred to as "EHA."

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of accounting - The financial statements are prepared on the accrual basis of accounting.

Principles of consolidation - All material intercompany transactions and balances have been eliminated in the consolidation.

Use of estimates - The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Cash and cash equivalents - EHA considers highly liquid instruments purchased with original maturities of three months or less to be cash equivalents. EHA has periodically throughout the year maintained balances in various operating and money market accounts in excess of federally insured limits.

Investments - Investments are recorded at fair value. EHA invests in various investment securities. Investment securities are exposed to various risks such as interest rate, market and credit risks. Due to the level of risk associated with investment securities, it is at least reasonably possible that changes in the values of investment securities will occur in the near term, based upon the markets' fluctuations, and that such changes could materially affect EHA's financial statements.

Contributions receivable - Unconditional promises to give that are expected to be collected within one year are recorded at net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using risk-adjusted interest rates applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Conditional promises to give are not included as support until the conditions are subsequently met.

Government contracts receivable - Government contracts receivable are recorded when qualifying expenditures are incurred and EHA has a signed contract for services.

Allowance for doubtful accounts - EHA determines whether an allowance for uncollectibles should be provided for contributions and government contracts receivable. Such estimates are based on management's assessment of the aged basis of its contributions and other sources, current economic conditions and historical information. Contributions and government contracts receivable are written off against the allowance for doubtful accounts when all reasonable collection efforts have been exhausted.

Fixed assets - Fixed assets are recorded at cost and depreciated over their estimated useful lives using the straight-line method. Leasehold improvements are recorded at cost and are amortized over the shorter of the term of the lease or its estimated useful life using the straight-line method. Items with a cost in excess of $5,000 and an estimated useful life of greater than one year are capitalized.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Net assets - Unrestricted net assets include funds having no restriction as to use or purpose imposed by donors. Temporarily restricted net assets are those whose use has been limited by donors to a specific time period or purpose. Permanently restricted net assets have been restricted by donors to be maintained in perpetuity.

Revenues from government agencies - Revenues from government agencies are recognized when earned. Expense-based grants are recognized as allowable expenses are incurred. Performance-based grants are recognized as milestones are achieved.

Contributed services - Contributed services are recognized as revenue if the services create or enhance nonfinancial assets or require specialized skills, are provided by individuals possessing those skills, and typically need to be purchased if not provided by donation.

Contributions - Unconditional contributions, including promises to give cash and other assets, are reported at fair value at the date the contribution is received. Contributions are reported as either temporarily or permanently restricted support if they are received with donor stipulations that limit the use of the donated assets. When a donor restriction expires, that is, when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified as unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

In-kind donations - In-kind donations are recorded at fair value.

Functional allocation of expenses - The costs of providing EHA's programs and other activities have been summarized on a functional basis. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Rent expense - EHA leases space at various locations. All leases are operating leases. Rent expense is recognized on the first day of each month for the current month's rent. All leases are reflected on the straight-line basis.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Grants to other organizations - EHA grants funds to charitable organizations for specific programs. Grants are recorded when approved by the EHA Board of Directors. Funds approved for payment are recorded as grants payable. As of June 30, 2013 and 2012, there were no outstanding grants payable.

Subcontracted services - Subcontracted services are recorded when services are incurred by the subcontractor. Advances to subcontractors are recorded as an asset. As of June 30, 2013 and 2012, there were no advances to subcontractors.

Measure of operations - EHA includes in its measure of operations all revenues and expenses that are an integral part of its program and supporting services and excludes investment income and disposition of restricted funds.

Prior-year summarized comparative information - The financial statements include certain prior-year summarized comparative information in total but not by net asset class. Such information does not include sufficient detail to constitute a presentation in conformity with accounting principles generally accepted in the United States of America. Accordingly, such information should be read in conjunction with the financial statements for the year ended June 30, 2012, from which the summarized information was derived.

Fair Value Measurements

Fair Value Measurements, ASC Topic 820, establishes a framework for measuring fair value. The framework provides a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are described below. Level 1 inputs to the valuation methodology are unadjusted quoted prices for identical assets or liabilities in active markets that EHA has the ability to access. Level 2 inputs to the valuation methodology include:

- Quoted prices for similar assets or liabilities in active markets;
- Quoted prices for identical or similar assets or liabilities in inactive markets;
- Inputs other than quoted prices that are observable for the asset or liability;
- Inputs that are derived principally from or corroborated by observable market data by correlation or other means.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Fair Value Measurements (continued)

If the asset or liability has a specified (contractual) term, the Level 2 input must be observable for substantially the full term of the asset or liability. Level 3 inputs to the valuation methodology are unobservable and significant to the fair value measurement. The asset or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques used need to maximize the use of observable inputs and minimize the use of unobservable inputs.

The following is a description of the valuation methodology used for assets measured at fair value. There has been no change in the methodology used at June 30, 2013 as compared to 2012.

Cash equivalents - Valued at the closing price reported on the active market on which the individual securities are traded.

Government and government agency bonds, common stock, corporate bonds, U.S. Treasury bonds and notes, and exchange-traded funds (ETFs) - Valued at the closing price reported on the active market on which the individual securities are traded.

The method described above may produce a fair value calculation that may not be indicative of net realizable value or reflective of future fair values. Furthermore, while EHA believes its valuation method is appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

The assets at fair value as of June 30, 2013 and 2012 are set forth by level within the fair value hierarchy in Note 3.

Uncertainty in income taxes - EHA has determined that there are no material uncertain tax positions that require recognition or disclosure in the financial statements. Periods ending June 30, 2010 and subsequent remain subject to examination by applicable taxing authorities.

Subsequent events - Subsequent events have been evaluated through December 2, 2013, which is the date the financial statements were available to be issued.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 3 - INVESTMENTS

	2013 (Level 1)	2012 (Level 1)
Cash equivalents	$ 30,067	$ 30,911
Bonds		
Corporate bonds	337,912	584,973
Government and government agency bonds	79,993	71,346
U.S. treasury bonds and notes	48,660	37,763
Common stock		
Basic materials	206,565	218,607
Conglomerates		98,165
Consumer goods	190,566	175,266
Financial	166,148	213,248
Healthcare	223,730	226,626
Industrials	63,540	30,713
Information technology	262,820	290,700
Services	229,156	264,284
Exchange-traded funds (ETFs) - equities	6,027	365,079
	$ 1,845,184	$ 2,607,681

Investment income consists of the following:

	2013	2012
Interest and dividends	$ 66,914	$ 112,943
Realized and unrealized gains on investments	240,537	27,183
Investment fees	(14,948)	(23,257)
	$ 292,503	$ 116,869

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 4 - CONTRIBUTIONS RECEIVABLE

Contributions receivable are recorded at their net realizable value. The contributions receivable are expected to be paid as follows:

2014	$ 207,206
2015	40,000
	$ 247,206

NOTE 5 - FIXED ASSETS

	2013	2012	Estimated Useful Lives
Office equipment	$ 47,507	$ 47,507	3 years
Furniture and fixtures	68,439	68,439	10 years
Leasehold improvements	472,824	472,824	10 years
	588,770	588,770	
Accumulated depreciation and amortization	(493,037)	(442,651)	
Net	$ 95,733	$ 146,119	

NOTE 6 - PENSION

EHA has a 403(b) defined contribution pension plan covering employees who meet age and length of service requirements. Pension expense was $119,053 and $107,477 for the years ended June 30, 2013 and 2012, respectively.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 7 - TEMPORARILY AND PERMANENTLY RESTRICTED NET ASSETS

Temporarily restricted net assets are available for the following purposes:

	2013	2012
Aquatics programs		$ 5,000
Conservation medicine field activities	$ 277,480	
Ecohealth Alliance Partners	40,265	305,636
Predict and prevent programs		163,160
	$ 317,845	$ 473,796

Temporarily restricted net assets have been released from restrictions by satisfying the following purposes:

	2013	2012
Aquatics programs	$ 5,000	$
Conservation medicine field activities	53,655	13,337
Ecohealth Alliance Partners	265,371	272,579
Predict and prevent programs	163,160	370,403
	$ 487,186	$ 656,319

Permanently restricted net assets are restricted to investments to be held in perpetuity. The investment income is available for the following purpose:

	2013	2012
Elephant conservation	$ -	$ 1,000,000

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 8 - OCCUPANCY

In 2005, EHA entered into a ten-year and five-month lease for office space in New York. On September 24, 2013 the lease was extended until December 31, 2023. Rental expense for the years ended June 30, 2013 and 2012 was $264,036 and $243,834, respectively.

Minimum lease payments are as follows:

Year Ending June 30,	
2014	$ 299,800
2015	369,600
2016	369,600
2017	397,100
2018	424,600
Thereafter	2,500,300
	$ 4,361,000

NOTE 9 - IN-KIND DONATIONS

EHA received the following in-kind donations:

Legal fees	$ 38,661
Public relations	690,600
Research	40,290
	$ 769,551

NOTE 10 - CONTINGENCIES

EHA is subject to audits by funding sources. Management believes that the results of such audits, if any, will not have an adverse effect on the financial statements.

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

JUNE 30, 2013

NOTE 11 - DISPOSITION OF RESTRICTED FUNDS

In March 2013, EHA reached an agreement with the Wildlife Conservation Network on the disposition of a restricted fund: the Elephant Crisis Fund, (part of EcoHealth Alliance Partners) which had been held by EHA.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

Federal Grantor/Pass-through Grantor/Program or Cluster Title	Federal CFDA Number	Pass-through Entity Identification Number	Federal Expenditures
Research and Development Cluster			
U.S. Department of Interior			
Fish and Wildlife Service			
Endangered Species Conservation - Recovery Implementation Funds	15.657		$ 74,491
Great Apes Conservation Fund	15.629		36,996
Total U.S. Department of Interior			111,487
National Science Foundation			
Biological Sciences	47.074		
Viral Pathogens			15,975
EcohealthNet			119,930
Kuming Workshop			9,020
Total National Science Foundation			144,925
U.S. Department of Defense			
Defense Threat Reduction Agency			
Biosurveillance Ecosystem Implementation	12.UNKNOWN		501,970
Total U.S. Department of Defense			501,970

- continued -

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

Federal Grantor/Pass-through Grantor/Program or Cluster Title	Federal CFDA Number	Pass-through Entity Identification Number	Federal Expenditures
Research and Development Cluster ***(continued)***			
U.S. Department of Health and Human Services			
National Institutes of Health			
Allergy, Immunology and Transplantation Research	93.855		$ 1,031,507
Biomedical Research and Research Training	93.859		
Pass-through from Arizona State University		12-850	107,264
Bushment Services	93.UNKNOWN		46,318
International Research and Research Training	93.989		496,791
The Ecology, Emergence and Pandemic Potential of Nipah Virus in Bangladesh	93.999		105,394
Total U.S. Department of Health and Human Services			1,787,274
United States Agency for International Development			
Global Viral Forecasting	98.UNKNOWN		
Pass-through from Global Viral Forecasting Incorporated		N/A	130,130
Emerging Pandemic Threat Program	98.UNKNOWN		
Pass-through from University of California-Davis		N/A	4,381,794
Total United States Agency for International Development			4,511,924
Total Research and Development Cluster			7,057,580
Total expenditures of federal awards			$ 7,057,580

See independent auditor's report.

The accompanying notes are an integral part of this schedule.

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

NOTE 1 - BASIS OF PRESENTATION

The accompanying schedule of expenditures of federal awards (the "Schedule") includes the federal grant activity of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. under programs of the federal government for the year ended June 30, 2013. The information in this schedule is presented in accordance with the requirements of Office of Management and Budget (OMB) Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*. Because the Schedule presents only a selected portion of the operations of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., it is not intended to and does not present the financial position, changes in net assets or cash flows of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Expenditures reported on the Schedule are reported on the accrual basis of accounting. Such expenditures are recognized following the cost principles contained in OMB Circular A-122, *Cost Principles for Non-Profit Organizations*, wherein certain types of expenditures are not allowable or are limited as to reimbursement. Negative amounts shown on the Schedule represent adjustments or credits made in the normal course of business to amounts reported as expenditures in prior years. Pass-through entity identifying numbers are presented where available.

NOTE 3 - SUBRECIPIENTS

Of the federal expenditures presented in the Schedule, EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. provided federal awards to subrecipients as follows:

CFDA Number	Program Name	Amount Provided to Subrecipient
47.074	Biological Sciences	$ 97,109
93.855	Allergy, Immunology and Transplantation Research	616,816

-continued-

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS

YEAR ENDED JUNE 30, 2013

NOTE 3 - SUBRECIPIENTS (continued)

CFDA Number	Program Name	Amount Provided to Subrecipient
93.859	Biomedical Research and Research Training	$ 17,240
93.989	International Research and Research Training	318,767
93.999	The Ecology, Emergence and Pandemic Potential of Nipah Virus in Bangladesh	27,144
93. UNKNOWN	Bushment Services	4,000
	Total	$ 1,081,076

LOEB & TROPER LLP

Independent Auditor's Report on
Internal Control Over Financial Reporting
and on Compliance and Other Matters
Based on an Audit of Financial Statements Performed
in Accordance with Government Auditing Standards

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc., which comprise the balance sheet as of June 30, 2013, and the related statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the financial statements, and have issued our report thereon dated December 2, 2013.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control. Accordingly, we do not express an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected, on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

655 Third Avenue, 12th Floor, New York, NY 10017
(212) 867-4000 / Fax (212) 867-9810 / *www.loebandtroper.com*

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s financial statements are free from material misstatement, we performed tests of their compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Purpose of This Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Loeb & Troper LLP

December 2, 2013

LOEB & TROPER LLP

Report on Compliance for Each Major Federal Program;
Report on Internal Control Over Compliance

Board of Directors
EcoHealth Alliance, Inc. and
Wildlife Preservation Trust International, Inc.

Report on Compliance for Each Major Federal Program

We have audited EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance with the types of compliance requirements described in the OMB Circular A-133 Compliance Supplement that could have a direct and material effect on each of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs for the year ended June 30, 2013. EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs are identified in the summary of auditor's results section of the accompanying schedule of findings and questioned costs.

Management's Responsibility

Management is responsible for compliance with the requirements of laws, regulations, contracts, and grants applicable to their federal programs.

Auditor's Responsibility

Our responsibility is to express an opinion on compliance for each of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s major federal programs based on our audit of the types of compliance requirements referred to above. We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and OMB Circular A-133, *Audits of States, Local Governments, and Non-Profit Organizations*. Those standards and OMB Circular A-133 require that we plan and perform the audit to obtain reasonable assurance about whether noncompliance with the types of compliance requirements referred to above that could have a direct and material effect on a major federal program occurred. An audit includes examining, on a test basis, evidence about EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance with those requirements and performing such other procedures as we considered necessary in the circumstances.

655 Third Avenue, 12th Floor, New York, NY 10017
(212) 867-4000 / Fax (212) 867-9810 / *www.loebandtroper.com*

We believe that our audit provides a reasonable basis for our opinion on compliance for each major federal program. However, our audit does not provide a legal determination of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s compliance.

Opinion on Each Major Federal Program

In our opinion, EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. complied, in all material respects, with the types of compliance requirements referred to above that could have a direct and material effect on each of their major federal programs for the year ended June 30, 2013.

Report on Internal Control Over Compliance

Management of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc. is responsible for establishing and maintaining effective internal control over compliance with the types of compliance requirements referred to above. In planning and performing our audit of compliance, we considered EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over compliance with the types of requirements that could have a direct and material effect on each major federal program to determine the auditing procedures that are appropriate in the circumstances for the purpose of expressing an opinion on compliance for each major federal program and to test and report on internal control over compliance in accordance with OMB Circular A-133, but not for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, we do not express an opinion on the effectiveness of EcoHealth Alliance, Inc. and Wildlife Preservation Trust International, Inc.'s internal control over compliance.

A deficiency in internal control over compliance exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A material weakness in internal control over compliance is a deficiency, or combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A significant deficiency in internal control over compliance is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance.

Our consideration of internal control over compliance was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies. We did not identify any deficiencies in internal control over compliance that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of OMB Circular A-133. Accordingly, this report is not suitable for any other purpose.

Loeb & Troper LLP

February 14, 2014

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST
INTERNATIONAL, INC.

SCHEDULE OF FINDINGS AND QUESTIONED COSTS

YEAR ENDED JUNE 30, 2013

Section I - Summary of Auditor's Results

Financial Statements

Type of auditor's report issued:	Unmodified		
Internal control over financial reporting:			
Material weakness(es) identified?	____ yes	X no	
Significant deficiency(ies) identified?	____ yes	X none reported	
Noncompliance material to financial statements noted?	____ yes	X no	

Federal Awards

Internal control over major programs:			
Material weakness(es) identified?	____ yes	X no	
Significant deficiency(ies) identified?	____ yes	X none reported	
Type of auditor's report issued on compliance for major programs:	Unmodified		
Any audit findings disclosed that are required to be reported in accordance with Section 510(a) of Circular A-133?	____ yes	X no	

Identification of major program:

CFDA Number	Name of Federal Program or Cluster
Various	Research and Development Cluster

Dollar threshold used to distinguish between Type A and Type B programs:	$300,000	
Auditee qualified as low-risk auditee?	X yes	____ no

ECOHEALTH ALLIANCE, INC.
AND
WILDLIFE PRESERVATION TRUST INTERNATIONAL, INC.

SCHEDULE OF FINDINGS AND QUESTIONED COSTS

YEAR ENDED JUNE 30, 2013

Section II - Financial Statement Findings

No matters were reported.

Section III - Federal Award Findings and Questioned Costs

No matters were reported.

COST SUMMARY

	Base Period			Option I			Option II			Option III			Option IV		
Direct Cost	Rate Hrly	Quantity Hrs	Total Amount	Rate Hrly	Quantity Hrs	Total Amount	Rate Hrly	Quantity Hrs	Total Amount	Rate Hrly	Quantity Hrs	Total Amount	Rate Hrly	Quantity Hrs	Total Amount
Senior Research Scientist	$ 98.18	2080	$ 204,094	$ 100.13	2080	$ 208,274	$ 102.13	2080	$ 212,440	$	XX	$	$	XX	$
Senior Software Developer III	$ 89.52	2080	$ 186,201	$ 91.31	2080	$ 189,925	$ 93.14	2080	$ 193,723	$	XX	$	$	XX	$
Senior Data Scientist III	$ 82.46	2080	$ 171,517	$ 84.11	2080	$ 174,948	$ 85.80	2080	$ 178,447	$	XX	$	$	XX	$
Data Scientist III	$ 33.75	1218	$ 41,108	15,062	1218	$ 36,238.00	16.31	1375	$ 37,925.11	$	XX	$	$	XX	$
Research Scientist II	$ 21.63	2080	$ 45,000	22,263,535	2080	$ 46,350.00	22,652,631	2080	$ 47,105	$	XX	$	$	XX	$
Research Assistant II	$ 16.23	1664	$ 32,000	19,907,923	1664	$ 32,960.00	20,301,923	1664	$ 33,950	$	XX	$	$	XX	$
Senior Software Developer III	$ 89.52	2080	$ 203,000	$ 91,380,879	2080	$ 186,000.00	$ 93,394,192	2080	$ 190,272.7	$	XX	$	$	XX	$
Software Developer II	$ 88.41	2080	$ 43,000	$ 11,185,762	2080	$ 93,170.00	$ 11,311,123	2080	$ 94,232	$	XX	$	$	XX	$
TOTAL DIRECT LABOR		XX	$ 626,600		XX	$ 650,865		XX	$ 668,564		XX	$		XX	$
LABOR BURDEN	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount
FRINGE BENEFITS	33.40%	$649,620.28	$ 216,966	33.40%	$650,865	$ 217,378.302	33.40%	$689,160.64	$ 230,179.6536	%	$	$	%	$	$
OVERHEAD			$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL LABOR BURDEN			$ 866,966			$ 867,563			$ 914,340			$			$
TOTAL MATERIAL EQUIPMENT			$6,295			6,295			6,295			$			$
TOTAL TRAVEL COSTS			$ 8,000			$8,270.00			$8,402.7			$			$
TOTAL SUBTOTHER DIRECT COSTS			$30,000			30,000.72			30,000.72			$			$
TOTAL SUBCONTRACTOR COSTS			$988,200			1,015,984.465			1,045,844.937			$			$
TOTAL DIRECT COSTS			$ 1,900,382			$ 1,955,577.4			$ 2,013,286			$			$
G&A, F&A TOTAL	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A OR F&A	43.17%	$ 958,045	$ 425,085	43.70%	$ 1,011,230	$ 450,316	43.12%	$ 1,034,348	$ 427,984	%	$	$	%	$	$
FACILITIES CAPITAL COST OF MONEY (FCCM) Annual Computed DIDTotal Cost			$ -			$			$			$			$
TOTAL COSTS			$ 2,325,330			$ 2,362,236			$ 2,161,136			$			$
FEE PROFIT	Fee Rate	Fee Rate Applied to Total cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost, excluding travel & FCCM	Total Amount	Fee Rate	Fee Rate Applied to Total cost excluding travel & FCCM	Total Amount
FEE OR PROFIT	%	$	$	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE			$ 2,325,330			$ 2,362,236			$ 2,161,136			$			$

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information
Computers	Apple	14-inch MacBook Air	$1,249	2	$2,498	Base Period	Current price on apple.com, including upgraded CPU, memory, and storage. Bulk order discount may apply.
Monitors	Apple	Thunderbolt Display	$999.00	3	$2,997	Base Period	Current price on apple.com. https://store.apple.com/us product MC914LL/B. Apple thunderbolt display 27 inch/imac 5120
					$5,495		

Note:
Government may be billed on a lump sum Final Invoice for individual items less than $5,000. Purchases for items that are over $5,000 will be separately billed at the actual contractual price.

TRAVEL

Trip #:	1	Location:	Boston, MA (HealthMap and ProMED-mail)			Contract Period
Purpose:	Meet with HealthMap and ProMED-mail editors					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$400.00	$284.00	$516.00	$120.00	$1,320.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in Boston	$120.00
Total:	$120.00

Trip #:	2	Location:	Carrboro, NC (Kitware)			Contract Period
Purpose:	Meet with Kitware database team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$442.00	$224.00	$194.00	$120.00	$980.00

Itemized Expenses for "Other"

Description	Amount
ransportation to/from airport and in Carrbor	$120.00
Total:	$120.00

Trip #:	3	Location:	Clifton Park, NY (Kitware)			Contract Period
Purpose:	Meet with Kitware visualization team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2		$224.00	$232.00	$320.00	$776.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$200.00
Transportation in Clifton Park/Albany	$120.00
Total:	$320.00

Trip #:	4	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$354.00	$120.00	$1,258.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Total:	$120.00

Trip #:	5	Location:	Washington, DC Area (DTRA and BSVE)			Contract Period
Purpose:	Meet with DTRA and the BSVE team					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
2	2	$500.00	$284.00	$354.00	$120.00	$1,258.00

Itemized Expenses for "Other"

Description	Amount
Transportation to/from airport and in DC	$120.00
Total:	$120.00

Trip #:	6	Location:	TBD (Digital Disease Detection Conference)			Contract Period
Purpose:	Attend Digital Disease Detection Conference hosted by HealthMap					Base Period

Days	# of People	Airfare	Per Diem	Lodging	Other	Total
4	2	$1,000.00	$568.00	$2,008.00	$120.00	$3,696.00

Itemized Expenses for "Other"

Description	Amount
sportation to/from airport and during confer	$120.00
Total:	$120.00

OTHER DIRECT COSTS

Description	Total Price	Contract Period	Additional Information
			List detailed description and additional information stating the need for the requirement and the method with which the total cost was calculated. Example: Twenty hours of laboratory usage is required to complete Task 4 and was calculated at a rate of $200 per hour. Laboratory hours were estimated based on experience with previous efforts of a similar size and scope.
Cloud Processing Services	$17,094	Base Period	Commercial cloud processing for modeling, data analysis, software development, and web hosting. Estimate is based on our
Domain Registrar	$ 160	Base Period	Annual cost for domain name and security certificates
Cloud Application Services	$ 840	Base period	Cost of Google Apps Services and data hosting ($10 per user per month for google apps with unlimited storage)
Data Purchasing	$ 2,400	Base Period	Additional global datasets will be purchased based on priority diseases and regions identified in consultation with DTRA COR
Code Hosting	$2,400	Base Period	Estimate is based on the monthly cost of a github.com platinum plan
Books and reference materials	$711.72	Base Period	Estimate is a subscription to Safari Books Online ($46.81/month), plus 5 additional book purchases at $30 each
Software Licenses	$700	Base Period	Additional licenses for software such as text editors and office tools (estimated $100 per person)
Publication Fees	$4,500.00	Base Period	Calculated based on average publication fee for PLoS (Public Library of Science) journals (2 publications x $2,250 per
Meeting Costs	$500.00	Base Period	This will support two all-day meetings with the partners at the EcoHealth Alliance office in NY. It covers printing, copying,
Recruiting	$700	Base Period	2 job listings at $350 per 30-day listing on StackOverflow careers
	$30,006		

SUBCONTRACTORS

Company Name	Total Price	Contract Period	Additional Information
Kitware	$505,033	Base Period	
Epidemico	$356,093.10	Base Period	
ISID	$128,079.63	Base Period	
Kitware	$520,183.55	Option I	
Epidemico	$366,478.89	Option I	
ISID	$131,922.02	Option I	
Kitware	$535,789.06	Option II	
Epidemico	$377,176.26	Option II	
ISID	$135,879.68	Option II	

Coversheet

Proposal Number	HDTRA114-AMD1-CBA-03-2-0022
Phase I Proposal Number	HDTRA114-AMD1-CBA-03-1-0170
Topic	CBA-03
Proposal Title	Global Rapid Identification Tool Set (GRITS)

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 West 34th Street 17th Floor
Tax ID	31-1726494	**City**	New York
DUNS	077090066	**State/Province**	NY
CAGE	3MMU3	**Zip**	10001 - 2320
Website	www.ecohealthalliance.org	**Country**	us

Cost

Year 1 Cost ($)	2117486	**Year 1 Duration (months)**	12
Year 2 Cost ($)	2177681	**Year 2 Duration (months)**	12
Year 3 Cost ($)	2244486	**Year 3 Duration (months)**	12
Year 4 Cost ($)	0	**Year 4 Duration (months)**	0
Year 5 Cost ($)	0	**Year 5 Duration (months)**	0

Applicant Certification

Organization Type	Non-Profit Organization
Regional Defense Finance and Accounting Service (DFAS) Office	DFAS COLUMBUS CENTER -- HQ0337
Regional Office of Naval Research (ONR) Office (applies to grants only)	
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	**Yes**

Agency 1	DTRA/J4C	**Contract/Grant No.**	HDTRA1-13-C-0029

Agency 2		**Contract/Grant No.**	
Agency 3		**Contract/Grant No.**	
Are you a current DoD Contractor or Grantee?	**Yes**		
Agency	DTRA/J4C	**Point Of Contact**	(b)(6)
Phone #	(b)(6)		

Principal Investigator 1		Business Official 1	
Prefix	Dr.	**Prefix**	Mr.
Name	Nicholas Preston	**Name**	Aleksei Chmura
Title	Director, Data Science and Research Technology	**Title**	Program Coordinator
Phone	2123804497 Ext :	**Phone**	2123804473 Ext :
Fax	2123804465	**Fax**	2123804465
Email	preston@ecohealthalliance.org	**Email**	achmura@ecohealthalliance.org

For any purpose other than to evaluate the white paper/proposal, this data shall not be disclosed outside the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if an award is made to the offeror as a result of or in connectic with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided ir the agreement. This restriction does not limit the right of the Government to use information contained in the data if it is obtained fr another source without restriction. The data subject to this restriction is contained on the pages listed below.

Proprietary Information (list page numbers)

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project. disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, r time, data science

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

Knowingly and willfully making any false, fictitious, or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 USC Sec 1001), punishable by a fine of up to $10,000, up to five years in prison, or both.

Volume I: Technical Proposal

I. Abstract

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We aim to enhance our current GRITS platform, developed with DTRA support, by scaling this system to handle large data volumes in near-real-time, enhancing diagnostic capabilities through network and cluster analysis, and improving visualization through use of the latest reactive web technologies. GRITS will also utilize the benefits and explore the integration of crowdsourcing, collective intelligence, and expert review. This tool will rely on automation to ingest media, extract key disease characteristics, and recommend resources, increasing the specificity of the data feed to an analyst's workflow. We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose and to connect with experts from ProMED, HealthMap and EcoHealth, thereby increasing our network of experts from digital surveillance and open source communities. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats, advancing our readiness to combat the broad class of chemical and biological threats posed by EIDs.

Keywords
disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, real-time, data science

II. Scope

A. Objective

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

B. Background

The discovery of HIV/AIDS in the 1980s marked the transition from declaring victory over infectious diseases, to global increases in disease emergence and re-emergence[1]. EcoHealth Alliance (EHA) is at the forefront of organizations working to 'get ahead of the epidemic curve' by identifying these threats before the next pandemic or extinction event. Our researchers pioneered the identification of the origins of pathogens, such as Nipah virus[2], SARS[3], and MERS[4]. We constantly seek innovative approaches to target our field surveillance efforts on emerging threats[5]. To this end, the global increase in the volume of data, from the growth of the web and instrumented systems, presents both a challenge to traditional surveillance approaches and a tremendous opportunity for novel discoveries.

Various biosurveillance technologies have been developed to monitor Internet data sources, for instance, syndromic surveillance initiatives target surrogate indicators of a disease outbreak[6]. As with other sectors, such as commerce, marketing, and finance, the challenge is to manage the

expanding volume of data while identifying signals of interest[7]. In the case of EIDs, access to emergent media, including participatory, personal, and interactive media, characterized by decentralized content generation (e.g. the blogosphere, internationalization, and social media), presents an opportunity to detect early mentions of disease characteristics and anomalies of interest.

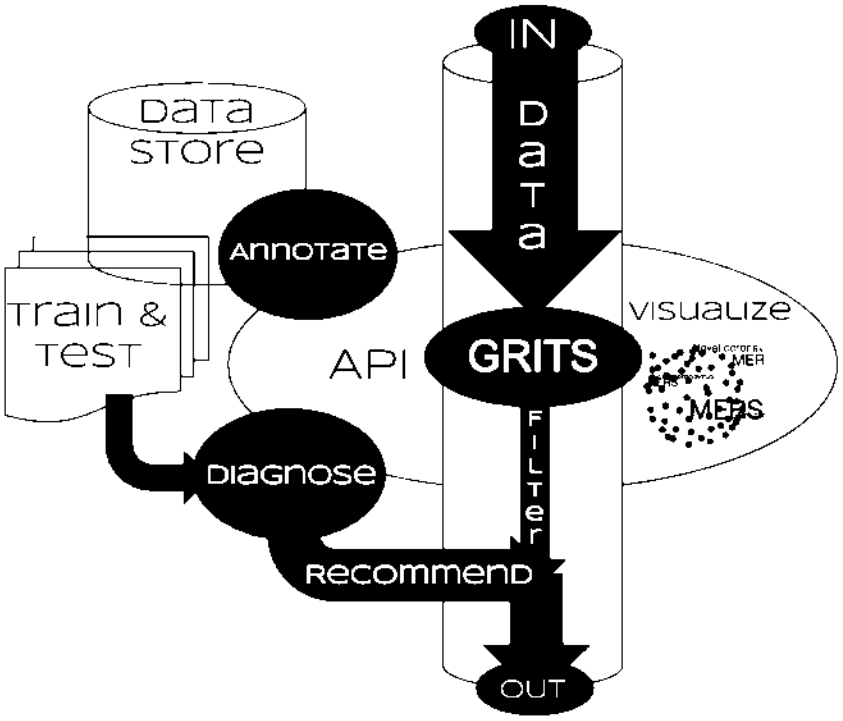
The GRITS partners are among the leading organizations in this domain. ProMED-mail (International Society of Infectious Diseases) manages a global email network of clinicians who are often among the first to identify and report disease threats[8]. Epidemico (HealthMap)[9] actively curates an expanding catalog of relevant news and social media assets. Both organizations are unique among their peers in leveraging broad networks of experts to curate and reduce the volume of media to a high-quality feed. Kitware Inc., our technical partner, has engineered sustainable communities around successful, high-impact open source scientific software.

EcoHealth assembled the GRITS team to advance the state-of-the-art in the detection and diagnosis of disease threats. GRITS combines new technologies with expert networks to apply the sciences of disease ecology and epidemiology to diagnosing big data for near-real-time disease situation awareness. We built GRITS upon pre-existing communities of expertise, rather than *de novo* technical solutions, recognizing that human experts must be integrated into the platform to ensure its intelligence and growth. In addition, we sought novel mechanisms for decision support by organizing, prioritizing, contextualizing, and linking information to relevant current and historic resources. Overall, we deploy science at the core of our systems to assemble near-real-time information in a manner that supports decision makers with diagnostic tools built by, and for, the digital disease ecology community. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats.

Description of GRITS Capabilities

We take a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS ingests and processes data feeds to provide decision support to analysts, with the following capabilities:

Diagnose - Identify the disease(s) described in a resource. Return a ranked list of disease with quantitative metrics of certainty (differential diagnoses).
Mine - Extract the key components of document via automated analysis, collective annotation, and expert curation. Return a set of relevant information.
Recommend - Expand the materials available to the analyst. Return a collection of recommended resources that provide historic and contemporary context.
Filter - Reduce the complexity of the data feed by selecting those documents that meet diagnostic criteria of interest to the analyst. Return a filtered subset of data.
Connect - Relate the material to underlying ontologies to provide a decision framework for the analyst. Return connections to other bioevents based on underlying network structures (e.g. geography, ecology, time, host, pathogen, and environmental drivers).



Sources of GRITS biointelligence

A. Machine	Data mining, machine learning, and natural language processing
B. Expert	Elicitation, consultation, and peer review
C. Collective	Crowdsourcing annotation and human intelligence tasks

A. Machine

GRITS leverages automation to ingest, process, and return an initial diagnosis of digital media, reducing the extraneous sources of information through which experts and reviewers must sort. The GRITS text mining system extracts key disease characteristics, such as locations, case counts, and dates, for our metadata and diagnostic models. These features, which may be combined into composite features by high level rules, are based on sentence patterns and keywords chosen from third-party sources such as WordNet, Geonames, Disease Ontology, Symptom Ontology, and Biocaster Ontology. The categories we extract, such as hosts, pathogens, diseases, signs and symptoms, drivers, and transmission types, are also informed by historic disease event data curated via our GRID project, and prioritized through consultation and testing with our experts. The GRITS diagnostic models, that use machine learning algorithms based on extracted keywords to classify articles, are trained on test articles labeled with diseases by our partners. A key function of this machine intelligence is to provide the materials and platforms to crowdsource the training data.

B. Expert

GRITS is designed to be tightly integrated with a broad network of experts who contribute

relevant domain expertise ranging from disease ecology, wildlife health, epidemiology, biosurveillance, and medicine. We propose to enhance the accuracy of text mining service through expert consultation and close integration with public ontologies maintained by expert communities. We currently rely on experts to curate our content; however, we hope to close the loop by allowing BSVE users to contact these expert communities for input, including diagnostic advice, regional expertise, and language support (GRITS.net).

To fully levy the expert community, we propose extending GRITS to provide more insight and flexibility in its operation. We wish to create mechanisms for experts to edit and examine the effects of keywords on diagnosis, customize extracted features, and provide feedback on the 'best' diagnosis, thereby iteratively generating training data for the diagnostic algorithms. We also intend to leverage our expert network to test the article representations we use for classification through game-based mechanisms to identify areas for improvement in our representations. By combining a rule-based system with an algorithmic approach, the platform maintains both greater potential for expert input and easy interpretation for non-technical users.

C. Collective

The machine learning component of GRITS requires training data from portfolios of articles with disease labels and disease characteristic metadata, information collected from HealthMap and ProMed editors in order to highlight and categorize important features and relationships. These are then used to train classifiers to identify specific features of importance. To extend the range of articles we can classify, we propose using crowdsourcing methods via Amazon's Mechanical Turk and Zooniverse to generate labels and annotations for articles that do not require domain expertise.

To further enhance the accuracy of the GRITS classification algorithms, we propose crowdsourcing a diagnostic challenge, whereby we host and share our training data on an existing challenge platform (e.g. Kaggle), where programmers compete to build classifiers to improve accuracy.These approaches would compliment the models developed by our internal users and promote global citizenship in combating the scourge of emerging infectious disease. Finally, we propose integrating EHA's Global Repository for Infectious Diseases (GRID) to solicit collective intelligence and peer editing to develop a canonical collection of event data portfolios for BSVE users and the broader scientific community.

Our three-pronged approach (machine, expert, and collective) is a unique strength of the GRITS platform. Experts contribute keywords and rules to improve automated text mining tools, identify human intelligence tasks, and prioritize areas for algorithm development. Meanwhile, the automated tools enable experts to make the best use of their time by farming out less specialized tasks to the crowd, identifying errors in the data sources, and notifying editors or creating tasks to crowdsource solutions. In the case that there isn't enough data to deliver an accurate diagnosis, GRITS will identify the most useful information in distinguishing disease candidates and recommend an expert or field team to consult from our network (GRITS.net). Combined, this presents a unique conceptual model and workflow for supporting outbreak investigation.

Proposed Development

GRITS enhances traditional search with adaptive diagnostic models, trained on a broad spectrum of resources from GRITS partners and curated by our communities of experts. This

diagnostic function reduces the complexity and increases the specificity of the data feed to an analyst's workflow. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. To ensure rapid diagnosis when a disease first emerges, GRITS blends social media, news media, and scientific literature. This approach may be further leveraged to identify unusual events and diagnostic gaps that may herald an emerging infectious disease of unknown etiology.

BSVE integration and benefits

We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards for decision support via additional visualizations and diagnostic tools.
The GRITS interface in BSVE will connect users to experts from ProMED, HealthMap and EcoHealth. The data processing stack will provide the capabilities identified above (diagnose, mine, recommend, filter, and connect) to data being ingested or monitored by the BSVE, including those proposed in the BSVE Data Challenge. Our diagnostic service is designed to continually evolve and improve via mechanisms for input from collective, expert, and machine intelligence sources. Our novel approach to diagnostics builds upon traditional search with the infusion of disease ecology into the methodology.

Technical Challenges

Due to incomplete reporting, errant diagnoses, delayed onset of symptoms, and delays in laboratory results, it is difficult diagnose diseases in the early phase of an outbreak[10]. Dialect varies among data sources and there is high variability in accessibility of news sources and scientific literature. Software has a language bias where non-latin characters are often the source of bugs, and foreign language articles require translation to fit into a single NLP pipeline. Additionally, media attention is biased toward OECD countries, with blind spots in some of the locations where diseases more frequently emerge, particularly those with limited clinical infrastructure and access to health professionals[11]. However, as a shared and accessible platform that can maximize the utility of both expert networks and machine intelligence, our tool is of particular value in resource-poor areas without laboratory diagnostic facilities or, with past events, where clinical samples are no longer available. To reduce the time-lag in detecting EIDs, we are interested in identifying prompt data sources and recruiting members of the GRITS network and BSVE community in disease prone environments to provide additional reports of emerging diseases.

When attempting to respond to user submitted corrections and feedback, some classifiers take considerable time to train (e.g. neural nets), and completely retaining any classifier on big data can be prohibitive. We will need to investigate methods of incrementally retraining our classifier in a timely manner as new data is submitted.

Technical merit

Overall, we propose to expand our automated data extraction to support reporting initiatives and event notification systems with near-real-time automated extraction of disease-relevant information from an arbitrary, unstructured data feed. Further development of the GRITS text mining system will allow us to introduce ecological and epidemiological concepts to extract more complex information such as host-pathogen relationships and quantitative data (e.g. case counts) for modeling and analysis[12]. We want to improve the precision of the features we extract

by developing more sophisticated natural language processing pipelines. Additionally, we plan to reduce error rates by taking advantage of the open source NLP software ecosystem to perform word sense disambiguation and coreference resolution. Identifying the features GRITS and BSVE users value and providing channels for them to provide us with feedback will also be important to improving GRITS. We propose dynamically retraining the classification algorithm GRITS uses to diagnose diseases based on user submitted corrections to its diagnosis. Finally, we plan on open sourcing reusable components of our system so that other groups can benefit from our work.

Our technology stack consists of modern web technologies such as Meteor that allow us to seamlessly update the content of the UI in near-real-time. These frameworks are compatible with the current technologies in the BSVE, such as AngularJS. We are actively investigating distributed processing technologies, such as Storm, that would allow us to process large volumes articles in parallel. Furthermore, we employ implementations of machine learning algorithms from scikit-learn, and are using natural language processing algorithms (e.g. tokenizing, part-of-speech-tagging, lemmatization) from nltk, and CLIPS pattern. We have started with a Python ML/NLP stack because of the rich software ecosystem available, and the ability to prototype rapidly with IPython notebooks.

Scientific merit

Automated categorization of EID reports by the GRITS diagnostic classifier will enable analysts and to search and filter them, increasing the ratio of relevant information they review. Furthermore, GRITS will provide decision support by suggesting potential diseases in reports of unknown diseases, and by recommending relevant data to review and organizations to contact. An established networks of experts from EcoHealth, and One Health will provide input on our diagnostic engine enabling us to continually improve upon it. Infectious disease emergence is a global-scale challenge requiring an extended, engaged community to monitor, track and respond to new threats; it is also also intrinsically interdisciplinary given the complex life histories of many disease agents.

Ontologies are invaluable tools in artificial intelligence systems, decision support systems, data exploration and research where they can be used to make complex inferences and generate rich datasets. We seek to expand the scope of our ecological ontologies by considering taxonomic, distribution, ecological niche, and networks for pathogens and hosts. This will help us provide state of the art diagnostics for the BSVE by providing structured data from which we can make inferences with GRITS diagnostic algorithms. We plan to use the biointelligence extracted from news media and submitted by GRITS users to assemble a corpus of new information to form the basis of new relationships and entities within biological ontologies to help explain patterns of disease emergence. We are interested in incorporating these relationships and entities into public ontologies they derive from or relate to so that other projects benefit from our work. Our goal, with the work we propose, is to push our system so that more components operate in near-real-time, provide recommendations of to users for additional data-sources, work with citizen scientists to expand the data inputs to diagnostic tools, and integrate various GRITS components into the BSVE community.

C. Programmatics

This effort will support DoD CBDP, DTRA, and the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), HDTRA1-14-CHEM-BIO-BAA, Chemical

Biological Technologies Department and is submitted in response to Topic: CBA-03: Next Generation Analytic Capabilities for BSV. The work will support DTRA's mission to safeguard America and its allies from biological WMDs by providing diagnostic capabilities to reduce, eliminate, and counter microbial threats. Specifically this "Global Rapid Identification Tool System" is aimed at developing capacity for the detection of EID threats, to support protection efforts and mitigation of the threats posed by disease agents through the New Initiatives in Science and Technology program. This technology is intended for eventual transition through the DTRA R&D Enterprise.

Management plan
Our management plan blends strong scientific expertise in global EID surveillance, with agile software engineering as well as iterative and incremental rapid application development. The project will be managed by our team of data scientists and software developers at EcoHealth Alliance, in consultation with thought leaders in the field of biosurveillance (Epidemico & ProMED-mail), and infused with innovative technologies Kitware Inc., developers of leading edge, high quality software.

Key personnel (roles/responsibilities)

- EcoHealth Alliance (prime): management, delivery, software integration, computing, diagnostic analysis, data science, data mining, disease ecology
    - Nico Preston, Ph.D. (Principal Investigator - PI)
- Kitware Inc.: data management, visualization
    - Jeff Baumes, Ph.D. (Technical Sub-contractor)
- Epidemico: data curation, digital surveillance
    - John Brownstein, Ph.D. (Scientific Consultant)
- ProMED-mail: data curation, disease outbreak reporting
    - Larry Madoff, Ph.D. (Scientific Consultant)

Current data providers and collaborating centers:

- **ProMED-mail** - the Program for Monitoring Emerging Diseases - is an open source Internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants. Electronic communications enable ProMED-mail to provide up-to-date and reliable news seven days a week. Sources of information include media reports, official reports, online summaries, local observers, and others. A team of expert moderators screen, review, and investigate reports before posting to the network and distributing by email. ProMED-mail currently reaches over 40,000 subscribers in at least 185 countries.
- **Healthmap** - The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health.
- **Global Repository of Infectious Disease (GRID) project** - an EHA project describing the initial emergence of global infectious disease bioevents since 1940. We collected direct language from the primary literature describing the agent, time, place, impact,

transmission, host, driver, EID category, and economics of the event to discover patterns and trends among these variables across time and space. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities.

- **EcoHealth Data (EcoHD)** - a warehouse of global open source data, including climate, ecological, demographic datasets.
- **GIDEON** - Global Infectious Disease and Epidemiology Network - is the world's premier global infectious diseases knowledge management database. It contains a diagnostic module that employs information on symptoms, country, incubation period, and laboratory tests to construct a ranked differential diagnosis. The Infectious Diseases module encompasses over 340 infectious diseases, 231 countries, over 500 anti-infective drugs and vaccines.
- **PubMed, Google Scholar, and Web of Science** - will be used to generate records of confirmed diagnoses and historical outbreaks. Additionally, we hope to explore archival resources such as CDC disease reports.

D. Relevance

Our goal with this project is to develop a tool system of high-relevance to DTRA's Goals and Objectives. With the support of DTRA, we could advance our GRITS to full development and extend timely operational capability to all sectors affected by the threat of EIDs. This state-of-the-art technology will help advance our readiness to combat the broad class of biological threats posed by EIDs, including the capability to identify agents with the potential to be used as WMDs. We have the expertise and capacity to ensure useable capability of the GRITS application within the timeline of tasks we propose. The tools will provide near-real-time decision support to end-users of GRITS and the BSVE. By using open source and transparent methods, we ensure that our results are reproducible and that the technology is portable, reliable, agile, and flexible in confronting emerging threats. The tools we propose are state-of-the-art, both scientifically and technically. GRITS leverage the latest reactive web technologies (e.g. Meteor), visualization environments (e.g. WebGL and Tangelo), and scientific databases (e.g. Girder). The machine learning and clustering algorithms are drawn from Scikit-learn, an open and accessible, community-supported Python library.

A key strategy in mitigating EID risk is to build situational awareness as far forward from our shores as possible, by using advanced digital biosurveillance to detect early signals that portend the emergence of high-risk, priority diseases and pathogens, including bioterrorism agents. This biosurveillance technology is adaptable to low resource settings, among them those most vulnerable to EIDs. Ultimately we hope to empower our warfighters and allies with the tools necessary to adapt and shape the dynamic Global Security Environment, as it pertains to the acute threat of infectious diseases.

Responses to DTRA's questions from the White Paper

How will the proposed system be sustained? Is a fee for service model envisioned? If so, details should be provided.

We propose providing to DTRA all of the data hosted in GRITS.db and all of the code developed for this proposed system under permissive open source licences (e.g. MIT and Apache2). Furthermore, EHA has established the Data Science and Research Technology (DART) lab, under the direction of Dr. Preston (PI), with the express goal of supporting the services outlined in this proposal. We envision sustaining the service under a 'fee for service' model to be

negotiated with DTRA upon delivery of the work. We would do so in coordination from our technical subcontractor, Kitware Inc., who have extensive experience supporting open source development for federal agencies, including DOD. Our data subcontractors have agreed to make the full data available to DTRA spanning the duration of the contract (beginning Jan 18, 2013). Where copyright restrictions limit our ability to distribute the full text of the media, we will provide programmatic tools to retrieve the text in compliance with the terms and conditions of the source. Continued access to our experts via GRITS.net, could also be negotiated with all parties under a fee for service model. Additionally, we propose a 'freemium' mechanism to sustain data hosting and processing costs, whereby DTRA-approved users or organizations could access the service on a pay-as-you-go basis (e.g. paying for characters processed or volume stored).

What will actually be delivered to the Government/BSVE? Will this simply be an API to the EHA system, or will underlying tools and data be delivered? If yes, please clearly describe all deliverables.

We are prepared to deliver all materials developed through the contract under permissive open source licenses. Given the complexity of the system, and the maintenance burden, we recommend that that the DART lab continue to maintain the materials on a mutually agreed upon third party service (e.g. AWS) and provide the access to the data and diagnostic capabilities through our API. The source code will be made available through a private Github repository. We will provide full documentation, as we have done for the data service we are currently providing to the BSVE developed by Digital Infuzion. This applies to all deliverables, including GRITS.app, GRITS.db, and GRITS.md. The GRID and EcoHD platforms have been developed with support from other agencies, foundations, and universities; however, we will provide unlimited access in perpetuity to DTRA via their respective APIs and web interfaces. The source code for Tangelo visualizations Girder are publicly available on Github and permissively licensed.

III. Credentials

A. Summary of Credentials

EcoHealth Alliance (EHA):

Building on over 40 years of groundbreaking science, EHA is a global nonprofit organization dedicated to protecting wildlife and safeguarding human health from the emergence of disease. The organization develops ways to combat the effects of damaged ecosystems on human and wildlife health. Using environmental and health data covering the past 60 years, EHA's scientists created the first ever global disease hotspots map that identified at-risk regions, to help predict and prevent the next pandemic crisis. That work is the foundation of EHA's rigorous, science-based approach, focused at the intersection of the environment, health and capacity building. Working in the U.S. and more than 20 countries worldwide, EHA's strength is founded on innovations in research, training, global partnerships, and policy initiatives.

EHA is a partner of the USAID Emerging Pandemic Threats PREDICT program, a $75 million effort focused on predicting and preventing pandemic diseases. PREDICT is building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people (zoonotic diseases). PREDICT has developed a SMART surveillance method (Strategic, Measurable, Adaptive, Responsive, and Targeted) that accounts for the fact that zoonotic pathogens, such as influenza and SARS, are responsible for the

majority of emerging infectious diseases in people, and that more than three quarters of these emerging zoonoses are of wildlife origin. The SMART surveillance approach is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. It also targets sentinel animal species at active human interfaces in hotspot regions to improve surveillance efficiency.

The PREDICT team builds on a broad coalition of partners to develop the global capacity to monitor diseases at the animal-human interface and develop a risk-based approach to concentrate these efforts in surveillance, prevention, and response at the most critical points for disease emergence from wildlife.

PREDICT project objectives:

- Assess local surveillance capacity;
- Implement targeted and adaptive wildlife disease surveillance systems;
- Develop and deliver new technologies to improve efforts close to the source;
- Use cutting-edge information management and communication tools to bring the world closer to realizing an integrated, global approach to emerging zoonotic diseases.

Partners:

HealthMap/Epidemico

Healthmap is a team of researchers, epidemiologists and software developers based out of the Children's Hospital, Boston. Founded in 2006, Healthmap is an established global leader in utilizing online informal sources for disease outbreak monitoring and real-time surveillance of emerging public health threats. The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases for a diverse audience including libraries, local health departments, governments, and international travelers. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health. Through an automated process, updating 24/7/365, the system monitors, organizes, integrates, filters, visualizes and disseminates online information about emerging diseases in nine languages, facilitating early detection of global public health threats.

ProMED

ProMED-mail was established in 1994 with the support of the Federation of American Scientists and SatelLife. Since October 1999, ProMED-mail has operated as an official program of the International Society for Infectious Diseases, a nonprofit professional organization with 20,000 members worldwide.

Kitware, Inc.

Kitware, Inc. creates and supports leading edge, high quality software in the fields of computer vision, medical imaging, visualization, 3D data publishing, and technical software development. Kitware employs an open source development model to foster extended, collaborative communities, and an open source business model to provide flexible, low-cost technical solutions. The Company's services and products include technology integration, software support, consulting, custom application development, and training and productivity tools that leverage our open-source software systems.

B. Summary of Qualifications for PI and Key Personnel

Dr. Nicholas Preston (PI), Ph.D., is the Director of Data Science and Research Technology at EcoHealth Alliance. He has data science experience in ecology, health, and computing and expertise managing technical projects with emerging web technologies. The tools and systems he develops are used by the EcoHealth community to identify new pandemic and extinction threats and to set priorities for biosurveillance and conservation. His work builds upon his postdoctoral research on virtual laboratories for collaborative research, recent examples include the Global Repository for Infectious Diseases (GRID); EcoHealth Data (EcoHD); global threats visualizations with WebGL (WiggleMaps), and the Global Rapid Identification Tool System (GRITS). Dr. Preston and his team will contribute expertise in geospatial data and analysis of the ecological origins of infectious disease emergence and digital disease surveillance.

Dr. John Brownstein is an Associate Professor at Harvard Medical School and directs the Computational Epidemiology Group at Children's Hospital Informatics Program in Boston. His group is supported by a multi-million dollar budget with support from NIH (NLM and NIAID), USAID, Centers for Disease Control and Prevention, and Google.org. He has pioneered efforts in participatory epidemiology, using statistical and informatics approaches aimed at improving public health surveillance and practice. He recently was awarded the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government to outstanding scientists and engineers.

Dr. Lawrence Madoff is an infectious disease physician whose career has been devoted to disease surveillance. Dr. Madoff is the Editor of ProMED-mail, which uses Internet-based communication and social media to detect and report emerging infectious diseases globally. He is currently Director of the Division of Epidemiology and Immunization at the Massachusetts Department of Public Health, which oversees infectious disease surveillance and immunization activities in the state. He is a fellow of the American College of Physicians and a Fellow of the Infectious Disease Society of America.

Dr. Jeff Baumes is a technical lead at Kitware Inc. He has significant expertise in information analysis and presentation. His contributions include novel graph clustering algorithms that allow cluster overlap, and algorithms for discovering subsets of individuals persistently connected over time. Over the last six years, he has been a major technical contributor to the open source Titan scalable analysis and visualization toolkit, which is an extension of the Visualization Toolkit to include informatics and information visualization capabilities. He has worked on projects in several fields surrounding Titan such as text analysis, bioinformatics, and social network analysis including funding from NSF, DOD, DOE, and NIH.

C. Summary of Facilities to Perform the Proposed Work

Facilities at EcoHealth Alliance (EHA)

EcoHealth Alliance (EHA) is a 501(c)(3) nonprofit organization that specializes in scientific research on the causes, origins, and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory. A core administrative staff of 11 employees support EHA's scientific team (15 core scientists, 100+ field staff) and are

available for work on this project through foundation support. EHA is equipped with 25 networked PCs including ARRA funded International Live Meeting Video Conferencing facilities. EHA has access to multiple servers, server support, and all necessary software on Mac, Linux, and Windows operating systems. Additional computing power is acquired from commercial cloud providers to meet project needs.

EHA has an active program of staff development and this is reviewed and adjusted annually as part of each employee's evaluation process. Specific provisions are made for internal training and external training resources, tuition support programs via a partnership with Columbia University, and active support of staff to spend time in collaborators organizations. All early stage investigators are mentored to provide guidance in research practices, grant management, administration and project management. Financial support from EHA core funds are available to support external tuition, travel to conferences and to conduct joint research in collaborator's institutions. There is no obligation for teaching time at EHA and all research staff are funded for 100% research time, however, there is a provision, through partnership with Columbia University, to enable staff to teach at the undergraduate and graduate level, with monetary support provided by Columbia University. Administration and other staff are supported in their efforts to enhance their careers by the provision of tuition fees for external courses, travel funds for conferences, and time off their core activities.

Facilities at Kitware Inc.
Kitware Inc. is headquartered just north of Albany, New York in a Clifton Park office complex. Kitware rents approximately 27,000 square feet of office space at this location. Kitware also has an office in Chapel Hill, North Carolina approximately 6,200 square feet in size. Both offices are linked via a common virtual private network and a shared phone system, and share financial and administrative personnel. They also have on-site office managers, lunchrooms, private meeting rooms, and advanced conference facilities including large screen projection systems and whole-room Polycom video conferencing systems. The proposed work will be performed at the Clifton Park site.

Kitware has a mixed environment of personal and shared computing platforms. Employees average three computers per person (desktop, laptop, and/or home system), with each computer typically equipped with multiple multi-core processors, a high-performance graphics card, dual monitors, and 8GB or more of main memory. These personal systems run a mix of Windows, Mac OS X, and Linux operating systems. Shared resources include compilation and testing farms as well as workstations running a variety of alternative operating systems for testing purposes, e.g., Windows XP or Vista. Kitware also maintains several servers to provide public access to the open source VTK, ITK, TubeTK, Titan, Slicer, CMake, and ParaView systems; to host web pages and web services for open source communities such as NA-MIC and Visomics; to operate open-access journals such as the Insight Journal and the Midas journal which has hosted workshop papers for nearly ten years; and to provide access to massive collections of public data for computer vision and medical imaging algorithm evaluation. Access to these systems is provided by a fiber connection to the internet yielding a total of 100 Mbit/second data rate.

Kitware hosts several special-purpose, high-end workstations, GPU systems, haptic systems, and magnetic and optical trackers. One such workstation is a multi-GPU computer featuring 6 NVidia GPU boards: 5 C2050 Tesla and 1 Quadro 5000 Fermi, as well as a 6-Core X5680 3.33GHz processor. A noteworthy haptic system is a MBP Freedom 7S haptic device, configurable for 6 or 7 degrees of freedom. To address large-scale distributed computing, the company maintains several clusters for development and testing. The clusters include: a twelve node testing cluster running mixed Linux and Windows operating systems; a four node Windows cluster with a gigabit Ethernet network; and a seven node Linux cluster with dual 64-bit Xenon processors, high-end graphics accelerators, and an Infiniband network driving a 3x2 PowerWall display. Kitware also has access to several external computer systems (e.g. HP, IBM, and Intel) through various vendor partnership programs.

IV. WORK TO BE PERFORMED.

A. General

Our goal over the 3-year time period is to expand our DTRA-funded GRITS platform to deliver near-real-time disease diagnostics, decision support, and data processing. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, and connected to our network of experts from One Health, EcoHealth, and open source communities.

We are currently building a robust and scalable software infrastructure to provide a diagnostic decision support system for analysts with multiplier effects by connecting to a community of experts and data from EcoHealth Alliance, HealthMap, and ProMED-mail. The final deliverable will include our user interface (GRITS.app), application interface (GRITS.api), network of experts (GRITS.net), media diagnostics (GRITS.md), and database (GRITS.db). Overall, GRITS will be deployable and generalized application that will output probabilities and lists of pathogens likely responsible for an outbreak on the basis of user-provided data. Accordingly, the resource will be adaptable to a specific organization or agency's needs or emerging threats, and geographic areas of high concern. The source code for this algorithm will be made available to interested parties for further development and adaptation.

The original Rapid Identification Tool (RIT) prototype was developed by manually extracting symptoms from encephalitides reports in ProMED-mail to train a diagnostic model. Through rigorous testing, we identified modeling approaches that improved performance by combining natural language processing and machine learning algorithms. We recognized automated data collection and crowdsourced data curation would be needed to scale to disease coverage and diagnose additional diseases with greater precision. The GRITS diagnostic dashboard provides decision support to experts at our partner organizations by automatically extracting and visualizing information from media. We leverage crowdsourcing techniques by providing experts with tools for curating disease portfolios and annotating articles. We have developed an application programming interface (API) for access to our data and diagnostics by third party developers and users. Additionally, we integrated the project with ongoing EHA initiatives to collect historical disease outbreak data (Global Repository for Infectious Diseases - GRID) and background data for the drivers of disease emergence (EcoHealth Data - EcoHD). Finally, we integrated work from our colleagues at Kitware to support the storage and visualization of the large, complex datasets being generated.

During the proposed contract period, we will improve the accuracy and robustness of the GRITS media diagnostics. We will design new visualizations for the diagnostic dashboard to allow users to gain additional insights into our data and tools; develop a near-real-time processing stack to enable our visualizations and diagnostics to use the latest information; gain additional advantages from our collective intelligence network by adding new mechanisms for experts to provide feedback and interact with our underlying data, rules, and algorithms; experiment with crowdsourcing as an additional source of training data and knowledge to further improve GRITS.md; and expand the capabilities of the system to provide decision support and recommendations to analysts.

By the end of the contract period GRITS will provide:

1. Robust architecture for near-real-time diagnostics and data processing
2. Interface from BSVE to GRITS with SDK
3. Healthmap, ProMED-mail, and EcoHealth data to the BSVE
4. Machine, expert, and community intelligence

Diagnostic modeling
We plan to use the biointelligence extracted from news media and submitted by GRITS users to form the basis of new relationships and entities within biological ontologies that link EID events, diseases, symptoms, hosts, and other entities and attributes related to infectious diseases together in a rich network structure. This ontology will be a critical data source for making domain specific inferences in diagnostic algorithms.

Data Storage and Management
Girder is a data management platform built to meet the needs of distributed, data-centric web applications. Girder is a modular framework that allows developers to build systems that use any or all of the components necessary to create a system tailored to their needs. All data sharing web applications need the same core functionality: upload, download, large data storage, supplemental metadata storage and indexing, authentication/authorization, a RESTful API, and an extensible plugin architecture. Girder provides these components and is currently being used for GRITS as well as several DOE projects.

Visualization
Tangelo is a system for rapid production of visual and interactive web applications. Using HTML5 standards such as SVG, WebGL, and 2D canvas, Tangelo integrates visualization modes spanning charts, hierarchical diagrams, and networks for time series, heterogeneous, or multivariate data. Tangelo provides interfaces to powerful visualization libraries such as GeoJS, ParaViewWeb, and D3.

B. Summary

Year 1 (2015)
1. Connect GRITS Girder database to the BSVE
2. Develop recommendation and decision support capabilities
3. Connect GRITS diagnostic and text-mining APIs to the BSVE
4. Prototype near-real-time processing
5. Build BSVE interface to GRITS with the SDK

6. Connect GRITS expert network (GRITS.net) to the BSVE
7. Test diagnostic dashboard with expert communities.

Year 2 (2016)

8. Enhance the expert annotation interface
9. Build mechanisms to crowdsource annotations
10. Incorporate disease network graphs to assist diagnostics
11. Support diagnostic algorithm development with dashboard
12. Expand diagnostic capability to arbitrary data feeds
13. Connect GRITS to GRID
14. Update diagnostic model in near-real-time
15. Use text mining to extend network graphs/ontologies.

Year 3 (2017)

16. Crowdsource improvements to the GRITS media diagnostic tool
17. Connect GRID's collective intelligence editor to the BSVE
18. Connect GRITS diagnostic data filtering to the BSVE
19. Enrich diagnostic dashboard with dynamic visualizations
20. Generate disease summary reports from diagnostics
21. Connect EcoHD to GRITS recommendations
22. Create a web-crawler for expanding coverage of disease reports
23. Forecast disease emergence

C. Detailed Tasks

Task 1: Connect GRITS Girder database to the BSVE
Description: Coordinate with BSVE developers to provide API access to GRITS database (HealthMap, ProMED and EcoHealth data with diagnostic metadata).
Resources: EcoHealth & Kitware (API, BSVE support), HealthMap & ProMED (data)
Metric(s) of success: BSVE access to GRITS data via API
Deliverable: API key and access for the BSVE team, communication between BSVE/GRITS
Subtasks:

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities
Description: Use our GRITS.md to extract features of incoming articles to inform media recommendations for analysts based on areas or keywords of interest or a collection of documents being evaluated. Identify targets for data collection that would most enhance diagnostic capabilities for a particular event.
Resources: EcoHealth (algorithms and infrastructure), Kitware (storage & visualization), HealthMap & ProMED (testing)
Metrics of success: Recommendation system returns relevant articles, people and organizations. Adding recommended information improves diagnosis.

Deliverable: API and diagnostic dashboard interface to recommendations
Subtasks:

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE
Description: Provide BSVE developers with API access to GRITS media diagnostics and text mining tools and support them as they integrate these features into the BSVE interface.
Resources: EcoHealth (API development, BSVE support)
Metrics of success: BSVE team satisfied with API structure. GRITS features and diagnoses accessible through BSVE.
Deliverable: API access for the BSVE team, communication between BSVE/GRITS.
Subtasks:

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing
Description: Develop near-real-time architecture based on ideas from the lambda architecture, which allows high-performance integration of near-real-time streaming data with pre-processed data. Evaluate possible software tools for each component. Set up prototype of software stack.
Resources: EcoHealth & Kitware (architecture, software evaluation, prototyping)
Metrics of success: Working prototype
Deliverable: Documentation of software architecture and choices, working prototype
Subtasks:

1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK
Description: Build an app on the BSVE SDK that allows BSVE users to submit text to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards where users can see additional visualizations and interact further with GRITS diagnostic tools.
Resources: EcoHealth (app development & testing)
Metrics of success: Users able to access GRITS through app deployed to BSVE
Deliverable: Deployed app, BSVE users able to access diagnostic dashboards
Subtasks:

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE
Description: GRITS is a bridge to experts from ProMED, HealthMap and EcoHealth. Two-way communication will benefit both BSVE and GRITS. We will develop mechanisms for BSVE users to submit requests for language, region, and diagnostic feedback, while allowing experts and organizations to opt-in and set availability to handle requests.
Resources: EcoHealth (experts and interface), ProMED and HealthMap (expertise)
Metrics of success: BSVE user can submit request to a GRITS expert. Language, region, and diagnostic expertise is available to DTRA and BSVE users.
Deliverable: BSVE interface through GRITS app to submit requests to experts
Subtasks:

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Test diagnostic dashboard with expert communities
Description: Give ProMED and HealthMap editors access to the diagnostic dashboard to test on relevant articles they encounter and incorporate their feedback.
Resources: EcoHealth (documentation, support), HealthMap & ProMED (testing)
Metrics of success: ease of use for editors, feedback obtained through the dashboard
Deliverable: write-up of feedback from editors
Subtasks:

1. Enhance and test dashboard UI for providing feedback
2. Write documentation of dashboard and provide to ProMED and HealthMap
3. Have editors test annotation dashboard and summarize their feedback
4. Incorporate changes or develop plan to make changes later

Task 8: Enhance the expert annotation interface
Description: Obtain feedback from experts on the annotation interface. Incorporate changes and add feedback mechanisms so that users can correct auto-generated annotations.
Resources: EcoHealth (annotation interface), HealthMap & ProMED (testing)
Metrics of success: ease of use for editors, feedback obtained
Deliverable: write-up of feedback from experts
Subtasks:

1. Write documentation of annotation interface and provide to experts
2. Have editors test annotation interface and summarize their feedback
3. Incorporate changes or develop plan to make changes later
4. Develop new forms of annotation that are less error prone and better inform text-mining and diagnostic algorithms.

Task 9: Build mechanisms to crowdsource annotations

Description: Identify human intelligence annotation tasks for crowdsourcing by citizen scientists and Amazon's Mechanical Turk
Resources: EcoHealth (annotation interface), Mechanical Turk (pay for annotations), Citizen Scientists (volunteers)
Metrics of success: Annotations crowdsourced. Improves diagnostics from annotations.
Deliverable: Crowdsourced annotations incorporated into GRITS training data
Subtasks:

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 10: Incorporate disease network graphs to assist diagnostics
Description: Model the geographic, ecological, and information structure of infectious disease networks and connect them to diagnostic API. Develop visualizations for diagnostic dashboard.
Resources: EcoHealth & Kitware (network modeling, visualization)
Metrics of success: Improved diagnostics from network reasoning
Deliverable: Visualizations of the network model in the diagnostic dashboard
Subtasks:

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 11: Support diagnostic algorithm development with dashboard
Description: Support multiple models for diagnosis, and continually reevaluate their effectiveness. Different algorithms may perform differently with time, origin, or diseases. Allow users to run and compare the results of different models via the diagnostic dashboard. Run automated jobs to compare the performance of models over time.
Resources: EcoHealth & Kitware (algorithm and interface development)
Metrics of success: Run and compare models from the dashboard
Deliverable: Capacity to compare model performance in the dashboard
Subtasks:

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 12: Expand diagnostic capability to arbitrary data feeds
Description: Develop robust scraping algorithms and provide an interface for users to connect data sources to GRITS.
Resources: EcoHealth (algorithms), Language translation service
Metrics of success: Users can submit relevant feeds to the GRITS system
Deliverable: Interface for submitting data feeds
Subtasks:

1. Build a submission interface for users to submit arbitrary feed

2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 13: Connect GRITS to GRID
Description: Incorporate GRID dataset into GRITS to give the platform a comprehensive historical perspective on EIDs and enhance analytic capabilities around drivers of disease behavior. Extend the recommendation system to include historic context from GRID (e.g. media and data). Use historic event data to expand to match targets for a disease or keyword.
Resources: EcoHealth (recommendation system, GRID)
Metrics of success: Diagnostic decision support enriched by **historic event data**
Deliverable: Improved recommendation system, match new reports with historic events
Subtasks:
1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 14: Update diagnostic model in near-real-time
Description: Retrain the classifier with new reports from HealthMap/ProMED or users submissions. Classify labeled training data with GRITS, for example correcting misclassification. Investigate classifiers capable of distributed training or incremental retraining.
Resources: EcoHealth (algorithm and architecture development)
Metrics of success: Model updates improve performance. Near-real-time classifier updates.
Deliverable: Enhanced classification infrastructure, retraining interface
Subtasks:
1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 15: Use text mining to extend network graphs/ontologies
Description: Use features extracted from disease reports to add entities and relationships to a disease network ontology. For example, linking case counts to locations.
Resources: EcoHealth (feature extraction and ontologies)
Metrics of success: Accuracy of entities and relationships extracted from our data sources.
Deliverable: An extended ontology generated by text-mining algorithms
Subtasks:
1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 16: Crowdsource improvements to the GRITS media diagnostic tool
Description: Sponsor public challenges (e.g. Kaggle) to solicit improvements to the GRITS media diagnostic by training better classifiers or by submitting additional training data.
Resources: EcoHealth & Kitware (challenge planning and execution)

Metrics of success: User submits an improvement with better performance (e.g. higher f-score)
Deliverable: Improved diagnostic tool from crowdsourced algorithms.
Subtasks:

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 17: Connect GRID collective intelligence editor to the BSVE
Description: Incorporate BSVE users as experts for the review and editing GRID events
Resources: EcoHealth (GRID)
Metrics of success: BSVE users contribute to GRID. Diagnostic models improve from GRID data. Additional features are extracted based on GRID data.
Deliverable: BSVE/GRITS access to GRID, improved diagnostics and feature extraction
Subtasks:

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 18: Connect GRITS diagnostic data filtering to the BSVE
Description: Use diagnostics to reduce data volume to relevant reports. Users should be able to list diseases or regions of interest.
Resources: EcoHealth (GRITS integration), Kitware (data filtering)
Metrics of success: GRITS will return a subset of related assets
Subtasks:

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 19: Enrich diagnostic dashboard with dynamic visualizations
Description: Add dynamic Tangelo visualizations, including interactive dendrogram views of likely diseases, multidimensional visualization of report space, and flexible geovisualizations with interactive vector graphics for high-performance imagery and dense data.
Resources: EcoHealth (GRITS integration), Kitware (visualizations)
Metrics of success: Visualizations enrich expert decisions on diagnosis
Subtasks:

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 20: Generate disease summary reports from diagnostics
Description: Aggregate the data collected by text-mining and diagnostic algorithms to give an meta overview of a collection of reports or disease outbreak.

Resources: EcoHealth (algorithms and reporting)
Metrics of success: Number of visits per unique user to the summary report website
Deliverable: API returns summary reports to diagnostic dashboard and BSVE
Subtasks:

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 21: Connect EcoHD to GRITS recommendations
Description: Extend the recommendation system to include data sources from EcoHD.
Resources: EcoHealth (recommendation system, EcoHD)
Metrics of success: API returns data layers that are relevant for decision support
Deliverable: EcoHD data for drivers of infectious disease
Subtasks:

1. Evaluate existing EcoHD API against needs of recommendation system
2. Implement changes to EcoHD API
3. Use tags or metadata to identify relevance of EcoHD data sources

Task 22: Create a web-crawler for expanding coverage of disease reports
Description: GRITS data is biased to English language sources and OECD countries. Create a robust web-crawler to broaden sources data and provide an interface for users to submit links.
Resources: EcoHealth (web crawler), HealthMap & ProMED (media expertise)
Metrics of success: Webcrawler finds and retrieves relevant media
Deliverable: Webcrawler service that submits articles to GRITS.db
Subtasks:

1. Build a web crawler for DTRA priority infectious diseases
2. Build a submission interface for users to submic urls
3. Test and evaluate and web crawler and global coverage
4. Close the loop with data partners by sharing new resources through API

Task 23: Forecast disease emergence
Description: EHA are experts in disease hotspot mapping. Use GRITS.db and GRITS.md to iidentify diseases that pose the greatest threat. Use case-counts and data from historical epi curves to model probable epi curves for new diseases
Resources: EcoHealth (hotspots modeling)
Metrics of success: The cumulative difference between the actual epi curve and predicted curve. Identify hotspots for disease emergence based on diagnostics.
Deliverable: Return geocoded hotspots via API for visualization on BSVE
Subtasks:

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Maintenance Plan

- Support the Global Rapid Identification Tool System (GRITS) on the cloud
- Develop a software process infrastructure for the GRITS developer community
- Build a robust server network to ensure uptime of the GRITS platform
- Develop a test suite to identify issues and ensure compatibility with the BSVE

- Develop user and developer documentation for the platform
- Maintain the software via a ticketing system.

V. Performance of Work

Year 1			
Q1	Q2	Q3	Q4

Connect GRITS Girder database to the BSVE

Develop recommendation and decision support capabilities

Connect GRITS diagnostic and text-mining APIs to the BSVE

Prototype near-real-time processing

Build BSVE interface to GRITS with the SDK

Connect GRITS expert network (GRITS.net) to the BSVE

Test diagnostic dashboard with expert communities.

Year 2			
Q1	Q2	Q3	Q4

Enhance the expert annotation interface

Build mechanisms to crowdsource annotations

Incorporate disease network graphs to assist diagnostics

Support diagnostic algorithm development with dashboard

Expand diagnostic capability to arbitrary data feeds

Connect GRITS to GRID

Update diagnostic model in near-real-time

Use text mining to extend network graphs/ontologies.

Year 3			
Q1	Q2	Q3	Q4

Crowdsource improvements to the GRITS media diagnostic tool

Connect GRID's collective intelligence editor to the BSVE

Connect GRITS diagnostic data filtering to the BSVE

Enrich diagnostic dashboard with dynamic visualizations

Generate disease summary reports from diagnostics

Connect EcoHD to GRITS recommendations

Create a web-crawler for expanding coverage of disease reports

Forecast disease emergence

VI. References

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Global Rapid Identification Tool System (GRITS)
Budget Justification

February 1, 2015 - January 31, 2018

Year 1

Direct Labor

Senior personnel
For this three-year budget period, the P.I., Dr. Nicholas Preston, will commit 75% time as the lead for all research by EcoHealth Alliance and partners on this project. Dr. Preston is the Director of Data Science and Research Technology (DART) at EcoHealth Alliance. His salary adjustment is being negotiated with our Board of Directors to reflect his experience and additional responsibilities at the organization. Dr. Preston will directly supervise the team of researchers, data scientists, and developers, as well as coordinate code integration, software development, reporting, research, scientific data management, and modeling efforts.

Other Personnel
We request **$525,220.80** in direct labor costs to accommodate hours devoted to the project. The positions and labor rates in the cost proposal comprise the experience and skills needed to realize the work outlined in the statement of work (SOW), including data management, infectious disease expertise, mathematical modeling, software development, natural language processing, computational linguistics, machine learning, technical writing, coordination with partner organizations, and web development.

Fringe benefits
Fringe benefits are calculated for EcoHealth Alliance as 32.3% of 12-month base salary.

Our direct labor costs including fringe total **$694,867.12**.

Other Direct Costs

Travel

We request **$1,193** to fund 2 visits (1 person x 1 night) for the Principal Investigator **to meet with the team members from HealthMap and ProMed Mail in Boston, MA**. Travel is calculated for 2 trips x (1 person x ((round trip airfare [$200]) + (2 travel days x [Meals and Incidentals ($53.25)]) + (1 night x [Hotel ($230)]))). The remaining $60 for each trip is budgeted for public transportation or cab service to and from the airport, and in Boston if necessary.

The Kitware teams are in two distinct locations. The database team is in Carrboro, NC while the visualization team is in Clifton Park, NY.

We request **$914** to fund 2 visits (1 person x 1 night) for the Principal Investigator **to meet with**

the database team members at Kitware's office in Carrboro, NC. Travel is calculated for 2 trips x (1 person x ((round trip airfare [$221]) + (2 travel days x [Meals and Incidentals ($42)]) + (1 night x [Hotel ($92)]))). The remaining $60 for each trip is budgeted for public transportation or cab service to and from the airport, and in Carrboro if necessary.

We request **$1,450** to fund 2 visits (2 people x 1 night) for the Principal Investigator and the Lead Developer **to meet with the visualization team members at Kitware's Clifton Park office outside of Albany, NY**. Travel is calculated for 2 trips x (2 people x ((round trip train [$100]) + (2 travel days x [Meals and Incidentals ($45.75)]) + (1 night x [Hotel ($111)]))). The remaining $60 is budgeted for each person for each trip for public transportation or cab service to and from the airport, and in Albany if necessary.

We request **$2,802** to fund 2 visits (2 people x 1 night) for the Principal Investigator and the Lead Developer **to meet with the DTRA Contract Officers and BSVE team in the DC area**. Travel is calculated for 2 trips x (2 people x ((round trip airfare [$250]) + (2 travel days x [Meals and Incidentals ($53.25)]) + (1 night x [Hotel ($224)]))). The remaining $120 for each trip is budgeted for each person for two (2) trips to and from the airport in New York City, as well as public transportation or cab service in Washington D.C.

Additional funds of **$3,707** are requested for one trip (2 people x 4 nights) for the PI and the Lead Developer **to attend the Digital Disease Detection Conference hosted by HealthMap**. This conference was hosted in San Francisco, CA in 2013, and we are using estimates from that trip to propose costs for the 2015 conference. This is the premier conference for the emerging field of digital disease detection. This meeting will provide the opportunity to showcase our work and interact with relevant peer networks. Travel is calculated for 1 trips x (2 people x ((round trip airfare [$500]) + (2 person x (3 days x [Meals and Incidentals ($71)])) + (2 person x (2 travel days x [Meals and Incidentals ($53.25)])) + (2 person x (4 nights x [Hotel ($226)])))). $260 is budgeted for transportation for two people, including two (2) trips to and from the airport for both, as well as public transportation or cab service during the conference.

Travel costs for Year 1 total $10,066.

All **Hotel and Meals & Incidentals** are calculated using FY2014 estimates in accordance with US Government Federal *per diem* regulations. The airfare or train fares are a calculated average of trips to the area during the specific time of year.

Materials and Equipment

We request **$18,360 (total)** for Materials and Equipment.

We have budgeted **$12,000** for commercial cloud processing for modeling, data analysis, and software development. Amazon Web Services (AWS) expenses listed in our budget are for three (3) accounts (approx. $333/mo for 12 months) for research, development, and testing.

These expenses reflect the computing time and resources needed by our developers to fulfill the tasks in the SOW, primarily the cost of processing high-volume, near-real-time data. AWS was selected as a sole source provider due to specific expertise. AWS is the world leader in cloud computing. AWS offers the full range of cloud computing tools, including virtual machines, storage, high performance computing, monitoring, virtual private networking, and databases. AWS has organization-wide Federal Information Security Management Act (FISMA) moderate level security certification, and has undergone multiple independent U.S. government security audit procedures.

We have budgeted an additional **$2,400** for purchasing additional global datasets; all other data will be derived from the public domain to share with DTRA. Additional data purchases will be contingent on the priority diseases and regions identified in consultation with DTRA COR (SOW 3.1) and will be made in compliance with our purchasing policies (see Pricing Integrity below).

$3,960 for computer supplies, which includes two (2) new Apple 13" Macbook Air laptops. These are priced at $1,981 each (past purchase cost $1,757 each, not including warranty). The additional hardware is necessary to ensure replacement equipment for EHA personnel and support efforts to complete the tasks outlined in the Statement of Work. Hardware purchases will be made in compliance with our purchasing policies, see Pricing Integrity (below).

Services

We request an additional **$2,400** ($200 per month) for code hosting with Github (Platinum) to maintain code hosting capabilities.

We also request **$1,881.48** ($156.79 per month) for data hosting services. This total includes $19.99 per month for Dropbox, and $5.99 per month for maintenance of off-site data backup and archival with CrashPlan (by Code 42), a competitively priced service with one of the world's most efficient cloud storage systems. The data hosting services also includes $70.00 per month for Google Cloud apps, which we use for all of our business software needs. This is a low-cost solution for real-time editing, document storage, video conferencing, presentations, and data entry. The Google Cloud protects our team from data loss and facilitates collaboration. These costs also include $46.81 per month for reference materials through the Safari bookshelf online electronic reference library. This service provides access to 34,000 technical titles on the latest technologies. The virtual nature of the service increases access and reduces cost. Finally, the monthly costs for data hosting include approximately $14 per month for a security certificate for a wildcard domain. This is priced at $160 per year, which breaks down to approximately $14 per month.

These code and data services facilitate rapid collaboration and ensure the resilience of the code through constant snapshots, secure hosting, version control, and routine backups. Dropbox and Github are sole-source as specific tools that are best in class and competitively priced. Both services are irreplaceable components of our workflow at EHA. The tools are compatible with

other ongoing projects for which there are no cheaper alternatives. The services are tied into our software process to ensure code integrity and to easily contribute resources from our code repositories and integrate updates from other projects. Our code is managed with Git version control for which Github is the leading commercial hosting service with instant collaboration in private and secure repositories. Dropbox is a secure cloud-based file sharing and backup service in use by over 2 million businesses. Additional information on the professional services selection process is provided in Pricing Integrity (below).

Other Expenses

We request **$5,000** in additional expenses. These costs are program specific and are not shared through the organization's indirect cost rate.

$500 is requested to support two all-day meetings with the partners at the EcoHealth Alliance offices in NYC. Meetings will begin at the opening of business, requiring overnight accommodation for our subcontractors. These costs cover printing, copying, additional support for meeting materials, conference line and room usage, and other supplies to enhance partner collaboration.

$4,500 is requested for two (2) publication fees. Our total is calculated from the average publication fee for PLOS (Public Library of Science) journals ($2,250 per publication).

Subcontracts

Funds are requested to support our subcontractors in their efforts to complete the tasks outlined in the Statement of Work. They are the same subcontractors with whom we have worked on the DTRA-funded GRITS platform.

Kitware Inc.

We request **$505,032.58** to Kitware Inc. for technical expertise in machine learning, text analysis, software development, data management, and data visualization. This covers approximately 835 labor hours for Jeff Baumes and Patrick Reynolds, and 1182 hours of work each for two (2) R&D Engineers. They also request travel funds for two trips (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and two trips (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. These costs include 82.8% Overhead and 38.4% General and Administrative costs, the latter of which is taken from the total of direct costs and overhead costs. They request a seven percent fee, which is standard for Kitware's cost reimbursement contracts. Unlike other contracts that have fully burdened rates that incorporate individuals' actual costs, indirect costs, and profit, the profit fee is added separately in cost reimbursement contracts. The total costs are $186,562.06 (direct) and $285,431.00 (indirect and G&A), and $33,039.51 (fee).

Epidemico

We request **$395,659.00** to Epidemico for expertise in digital disease surveillance, disease reporting expertise, disease modeling, as well as news and social media analysis. Epidemico is

a spinoff from Boston Children's Hospital, Harvard Medical School, and MIT that specializes in health data collection and analytics. The subcontract will cover salary for Dr. Brownstein, Clark Freifeld, a software programmer, a software developer, a project manager, and a data curator. They also request travel funds for two trips (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and two trips (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. Also included is a $10,000 HealthMap data license fee. These costs are supplemented by a 10% indirect cost rate. The total costs are $359,690.00 (direct) and $35,969.00 (indirect).

International Society for Infectious Diseases (ISID)
We request **$128,079.63** to ISID for disease reports, data collection, report moderating, and surveillance expertise. The subcontract will cover salary for Larry Madoff, Editor, and the IT Manager at ProMed-mail. Additional funds will support three (3) Editors who will devote time to the project and generate data. They also request travel funds for two trips (2 people, 1 night) to NYC to meet with GRIT partners at the EcoHealth Alliance offices, and two trips (2 people, 1 night) to Washington, DC to accompany the PI in meeting with DTRA Contract Officers. These costs are supplemented by an indirect rate of 15%. The total costs are $111,373.59 (direct) and $16,706.04 (indirect).

Indirect Costs
EcoHealth Alliance maintains efficient support logistics with a federally-approved overhead rate. We are requesting a low federally-agreed indirect rate of 44.1% on all direct costs. As per our Indirect Cost Rate agreement, we have applied our overhead rate only to the first $25,000 of each individual subcontract.

Total EcoHealth Alliance budgeted direct costs: $1,761,345.81
Total EcoHealth Alliance budgeted modified direct costs: $807,574.60
Total EcoHealth Alliance budgeted indirect costs: $356,140.40
Total EcoHealth Alliance budgeted costs: $2,117,486.21

Year 2 and Year 3

The justification for Year 1 applies to Year 2 and 3 with the following modifications.

Direct Labor

Senior personnel
Salary for Dr. Preston (PI) is increased by 3% in Year 2 and 3, which is the federally agreed rate increase.

Other Personnel
All salaries are increased by 3% in Year 2 and 3, which is the federally agreed rate increase.

Fringe benefits
Fringe benefits are increased at a rate of .5% per year. For Year 2, EcoHealth Alliance has determined a rate of 32.8% of 12-month base salary. For Year 3, the determined rate is 33.3% of 12-month base salary.

Other Direct Costs

Travel
Travel estimates for trips to DC are increased by 3% in Year 2 and 3 in anticipation of higher travel costs.

Travel estimates for trips to Boston, Carrboro, and Albany to visit GRITS partners are increased by 3% in Year 2 and 3 in anticipation of higher travel costs.

All Hotel and Meals & Incidentals are calculated using the available FY2014 estimates in accordance with US Government Federal per diem regulations.

Materials and Equipment
No increases in costs in Year 2 and 3

Services
No increase in costs in Year 2 and 3.

Other Expenses
No increase in previously-budgeted costs in Year 2 and 3.

An additional **$550** is requested in both Year 2 and Year 3 for future recruiting costs. For each year, these costs include a $350 job posting fee on Stack Overflow, $100 for business cards, and $100 to support a candidate presentation at the EHA offices to meet with fellow EHA staff (includes food, copying and printing materials, etc..). These costs are necessary to target and hire experienced candidates that can add to the robust data science, software development, and research team.

Subcontracts
Salaries and travel costs increased by 3% or less.

Indirect Costs
We are requesting a low federally agreed indirect cost of 44.1% on all direct costs. EcoHealth Alliance maintains efficient support logistics with a federally approved overhead rate. As per our Indirect Cost Rate agreement, we have applied our overhead rate only to the first $25,000 of each individual subcontract.

Year 2

Total EcoHealth Alliance budgeted direct costs: $1,812,463.61
Total EcoHealth Alliance budgeted modified direct costs: $828,159.27
Total EcoHealth Alliance budgeted indirect costs: $365,218.24
Total EcoHealth Alliance budgeted costs: $2,177,681.85

Year 3

Total EcoHealth Alliance budgeted direct costs: $1,868,447.81
Total EcoHealth Alliance budgeted modified direct costs: $852,694.34
Total EcoHealth Alliance budgeted indirect costs: $376,038.20
Total EcoHealth Alliance budgeted costs: $2,244,486.02

Pricing integrity & Contractual services

Independent Contractors:

Professional services

Contracts may be entered into for professional services such as legal services, audit and accounting services, public relations services, technology services, and other services requiring specialized expertise. Contracts greater than $5,000 must be competitively bid, with a minimum of three (3) bids. In unusual situations where the expertise is extremely specific, a sole source may be chosen, and must be preapproved by the CFO.

Contracts may be drafted by EHA or the service provider, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

Costs are reviewed among competing bids, and by review of industry standards.

Professional Services contracts are approved by the CFO.

Consultants

Contracts may be entered into for consulting services to carry out specialized work on our behalf. Consultants are used either for specialized expertise not existing on staff, or to accelerate the completion of approved work. Contracts greater than $5,000 must be competitively bid, with a minimum of 3 bids. In unusual situations where the expertise is extremely specific, a sole source may be chose, and must be preapproved by the CFO.

Costs are reviewed among competing bids, and by review of industry standards.

Contracts may be drafted by EHA or the service provider, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

Consultant contracts are approved by the President of the organization.

Subcontractors and Subrecipients

Subcontracts may be entered into to support work funded under various federal prime awards, subcontracts from Prime Contractors having federal awards or with private entities. Subrecipients are subcontractors that are specifically named in a federal award. The selection process for subcontracts and subrecipients are as follows:

Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to assess their capacity and their local relationships. Extensive review including CV's of principal investigators and their staff, administrative capacity, annual report and audit report reviews, indirect cost rate review, history of the institution

Costs are evaluated based on reasonableness, location of the work to be done, and the specific expertise needed for the funded work. Sub-Contracts are drafted by EHA, and must include name, address, complete contact information of provider, scope of work, identification of deliverables, timeframe for performance, payment terms, provision for termination and other information specified in the EHA standard contract form.

The prospective subcontractors reviewed among senior staff with a recommendation to the President for the decision.

Purchases

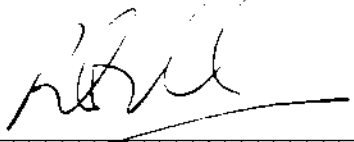
The Office manager is authorized to purchase supplies and equipment for the office and for computers for staff members. An office supply vendor is selected and reviewed annually. Selection is made based on competitive pricing for regularly purchased items, and quality of service. Purchases are made based on comparisons among online or physical catalogs.

Staff members may make purchases for items for their specific use, when the Office Manager cannot purchase them. Staff members must certify that the purchases are normal and reasonable costs.

Certificate of Current Cost or Pricing Data

This is to certify that, to the best of my knowledge and belief, the cost or pricing data (as defined in section 2.101 of the (FAR) and required under FAR subsection 15.403-4) submitted, either actually or by specific identification in writing, to the Contracting Officer or to the Contracting Officer's representative in support of Proposal No. HDTRA114-AMD1-CBA-03-2-0022 are accurate, complete, and current as of May 7, 2014. This certification includes the cost or pricing data supporting any advance agreements and forward pricing rate agreements between the offeror and the Government that are part of the proposal.

Firm __EcoHealth Alliance_____

Signature 

Name __Peter Daszak_____

Title ____President_____

Date of execution___5/7/2014_____

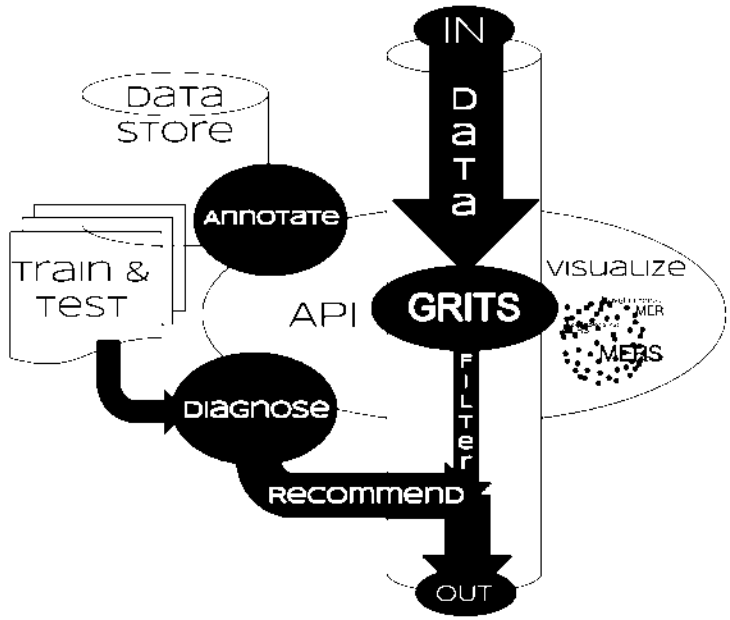
EHA Budget	Year 1		Year 1 Total	Year 2		Year 2 Total	Year 3		Year 3 Total	TOTAL
Direct Labor	*Rate (hour)*	*Quantity (hours)*		*Rate (hour)*	*Quantity (hours)*		*Rate (hour)*	*Quantity (hours)*		
PI Dr. Nico Preston (Director)	$67.00	1560	$104,520.00	$69.01	1560	$107,655.60	$71.08	1560	$110,885.27	**$323,060.87**
Senior Data Scientist (III)	$48.00	2080	$99,840.00	$49.44	2080	$102,835.20	$50.92	2080	$105,920.26	**$308,595.46**
Data Scientist (II)	$46.35	1040	$48,204.00	$47.74	1040	$49,650.12	$49.17	1040	$51,139.62	**$148,993.74**
Data Scientist (II)	$46.35	1040	$48,204.00	$47.74	1040	$49,650.12	$49.17	1040	$51,139.62	**$148,993.74**
Lead Developer (III)	$47.00	2080	$97,760.00	$48.41	2080	$100,692.80	$49.86	2080	$103,713.58	**$302,166.38**
Research Scientist (II)	$24.00	1560	$37,440.00	$24.72	1560	$38,563.20	$25.46	1560	$39,720.10	**$115,723.30**
Research Assistant (I)	$18.19	2080	$37,835.20	$18.74	2080	$38,970.26	$19.30	2080	$40,139.36	**$116,944.82**
Program Coordinator (II)	$24.72	2080	$51,417.60	$25.46	2080	$52,960.13	$26.23	2080	$54,548.93	**$158,926.66**
Total Direct Labor		**13520**	**$525,220.80**		**13520**	**$540,977.42**		**13520**	**$557,206.75**	**$1,623,404.97**
Fringe Benefits	0.323		$169,646.32	0.328		$177,440.60	0.333		$185,549.85	**$532,636.76**
Total Labor			**$694,867.12**			**$718,418.02**			**$742,756.59**	**$2,156,041.73**
	Cost (month)	*Quantity*		*Cost (month)*	*Quantity*		*Cost (month)*	*Quantity*		
Travel										
1 person to Boston (HealthMap & ProMED)	$596.50	2.00	$1,193.00	$614.40	2.00	$1,228.79	$632.83	2.00	$1,265.65	**$3,687.44**
1 person to North Carolina (Kitware)	$457.00	2.00	$914.00	$470.71	2.00	$941.42	$484.83	2.00	$969.66	**$2,825.08**
2 people to Clifton Park, NY (Kitware)	$725.00	2.00	$1,450.00	$746.75	2.00	$1,493.50	$769.15	2.00	$1,538.31	**$4,481.81**
2 people to DC (DTRA)	$1,401.00	2.00	$2,802.00	$1,443.03	2.00	$2,886.06	$1,486.32	2.00	$2,972.64	**$8,660.70**
2 people to Digital Disease Detection Conf.	$3,707.00	1.00	$3,707.00	$0.00	0.00	$0.00	$0.00	0.00	$0.00	**$3,707.00**
Materials & Equipment		*Quantity (months)*			*Quantity (months)*			*Quantity (months)*		
Cloud Processing	$1,000.00	12.00	$12,000.00	$1,000.00	12.00	$12,000.00	$1,000.00	12.00	$12,000.00	**$36,000.00**
Data purchasing	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	**$7,200.00**
Computer supplies	$330.00	12.00	$3,960.00	$330.00	12.00	$3,960.00	$330.00	12.00	$3,960.00	**$11,880.00**
Services		*Quantity (months)*			*Quantity (months)*			*Quantity (months)*		
Code hosting	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	$200.00	12.00	$2,400.00	**$7,200.00**
Data hosting	$156.79	12.00	$1,881.48	$156.79	12.00	$1,881.48	$156.79	12.00	$1,881.48	**$22,577.76**
Other expenses		*Quantity*			*Quantity*			*Quantity*		
Meeting support	$250.00	2.00	$500.00	$250.00	2.00	$500.00	$250.00	2.00	$500.00	**$1,500.00**
Recruiting costs	$0.00	0.00	$0.00	$550.00	1.00	$550.00	$550.00	1.00	$550.00	**$1,100.00**
Publication costs	$2,250.00	2.00	$4,500.00	$2,250.00	2.00	$4,500.00	$2,250.00	2.00	$4,500.00	**$13,500.00**
Total Materials & Equipment			**$37,707.48**			**$34,741.25**			**$34,937.74**	**$124,319.79**
Subcontractor Costs	*Rate (hour)*	*Quantity*		*Rate (hour)*	*Quantity*		*Rate (hour)*	*Quantity*		
Kitware										
Dr. J.Baumes (47.49)	$48.22	835.19	$40,272.86	$49.67	835.19	$41,481.05	$51.16	835.19	$42,725.48	**$124,479.39**
Patrick Reynolds (49.34)	$44.81	835.19	$37,424.86	$46.15	835.19	$38,547.61	$47.54	835.19	$39,704.04	**$115,676.51**
R&D Engineer (43.92)	$44.31	1,182.22	$52,384.17	$45.64	1,182.22	$53,955.69	$47.01	1,182.22	$55,574.36	**$161,914.23**
R&D Engineer (43.92)	$44.31	1,182.22	$52,384.17	$45.64	1,182.22	$53,955.69	$47.01	1,182.22	$55,574.36	**$161,914.23**
1 trip to NYC for 2 people	$806.00	2.00	$1,612.00	$830.18	2.00	$1,660.36	$855.09	2.00	$1,710.17	**$4,982.53**
1 trip to DC for 2 people	$1,242.00	2.00	$2,484.00	$1,279.26	2.00	$2,558.52	$1,317.64	2.00	$2,635.28	**$7,677.80**
Indirect Costs	0.828		$154,473.39	0.828		$159,107.59	0.828		$163,880.82	**$477,461.79**
General & Administrative	0.384		$130,957.61	0.384		$134,886.34	0.384		$138,932.93	**$404,776.88**
7% profit fee			$33,039.51			$34,030.70			$35,051.62	**$102,121.83**
		Subtotal	**$505,032.58**			**$520,183.55**			**$535,789.06**	**$1,561,005.19**
Epidemico (Healthmap)										
Dr. J. Brownstein	$77.25	800.00	$61,800.00	$79.57	800.00	$63,654.00	$81.95	800.00	$65,563.62	**$191,017.62**
Clark Freifeld, Senior Programmer	$55.00	800.00	$44,000.00	$56.65	800.00	$45,320.00	$58.35	800.00	$46,679.60	**$135,999.60**
Harold Rodriguez, Programmer	$37.55	1,880.00	$70,594.00	$38.68	1,880.00	$72,711.82	$39.84	1,880.00	$74,893.17	**$218,198.99**
Kate O'Brien, Front-end Software Developer	$32.19	1,760.00	$56,654.40	$33.16	1,760.00	$58,354.03	$34.15	1,760.00	$60,104.65	**$175,113.08**
Chi Bahk, Project Manager	$29.51	1,880.00	$55,478.80	$30.40	1,880.00	$57,143.16	$31.31	1,880.00	$58,857.46	**$171,479.42**
Carrie Pierce, Data Curator	$29.51	1,880.00	$55,478.80	$30.40	1,880.00	$57,143.16	$31.31	1,880.00	$58,857.46	**$171,479.42**
HealthMap License Fee			$10,000.00			$10,000.00			$10,000.00	**$30,000.00**
1 trip to NYC for 2 people	$1,500.00	2.00	$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35	2.00	$3,182.70	**$9,272.70**
1 trip to DC for 2 people	$1,342.00	2.00	$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73	2.00	$2,847.46	**$8,295.98**
Indirect Costs	0.10		$35,969.00	0.10		$37,018.07	0.10		$38,098.61	**$111,085.68**

		Subtotal	**$395,659.00**			**$407,198.77**			**$419,084.73**	**$1,221,942.50**
ISID (ProMED-mail)										
L. Madoff - Editor	$88.70	192.00	$17,030.40	$91.36	192.00	$17,541.31	$94.10	192.00	$18,067.55	**$52,639.26**
D. Tenenholz - IT Man.	$48.83	306.00	$14,941.98	$50.29	306.00	$15,390.24	$51.80	306.00	$15,851.95	**$46,184.17**
Fringe Benefits		0.30	$9,591.71	0.30		$9,879.47	0.30		$10,175.85	**$29,647.03**
Consultant - M. Pollack - Deputy Editor	$78.85	200.00	$15,770.00	$81.22	200.00	$16,243.10	$83.65	200.00	$16,730.39	**$48,743.49**
Consultant - Associate Editor	$22.15	1,970.00	$43,635.50	$22.81	1,970.00	$44,944.57	$23.50	1,970.00	$46,292.90	**$134,872.97**
Consultant - Copy Editor	$29.50	160.00	$4,720.00	$30.39	160.00	$4,861.60	$31.30	160.00	$5,007.45	**$14,589.05**
1 trip to NYC for 2 people	$1,500.00	2.00	$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35	2.00	$3,182.70	**$9,272.70**
1 trip to DC for 2 people	$1,342.00	2.00	$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73	2.00	$2,847.46	**$8,295.98**
Indirect Costs	0.15		$16,706.04	0.15		$17,207.22	0.15		$17,723.44	**$51,636.70**
		Subtotal	**$128,079.63**			**$131,922.02**			**$135,879.68**	$395,881.34
Total Subcontractor Costs	**Rate**		**$1,028,771.21**	**Rate**		**$1,059,304.35**			**$1,090,753.48**	**$3,178,829.03**
Total Direct Costs			$1,761,345.81			$1,812,463.61			$1,868,447.81	**$5,442,257.24**
Modified Direct Costs			$807,574.60			$828,159.27			$852,694.34	**$2,488,428.20**
Total F&A	0.441		$356,140.40	0.441		$365,218.24	0.441		$376,038.20	**$1,097,396.84**
Total Cost			**$2,117,486.21**			**$2,177,681.85**			**$2,244,486.02**	**$6,539,654.07**

Global Rapid Identification Tool System (GRITS)
CBA-03, Dr. Nico Preston, EcoHealth Alliance

Objective Leverage the GRITS platform to deliver real-time disease diagnostics and data filtering to the BSVE, powered by GRITS analytics, visualizations, data, and experts from OneHealth, EcoHealth, and Open Source communities.

Description of effort We developed the GRITS diagnostic platform with support from DTRA and propose to connect the system with the BSVE, as follows:
- Develop app with SDK to connect BSVE and GRITS
- Scale GRITS to return near-real-time diagnostics
- Process, store, and deliver expert, collective, and machine annotated disease reports
- Integrate our network of EcoHealth and One Health scientists to collectively curate data for the BSVE
- Leverage diagnostics to filter and recommend data to BSVE
- Expand and integrate diagnostic visualizations in the BSVE



Benefits of proposed technology
-Early warning of microbial threats
-Filtering to increase data feed relevance for analysts -Near-real-time differential diagnosis
-Enhanced decision support and data processing for BSVE
-Improved visualization through reactive web technology
-Increased network of experts and collective intelligence
Challenges Limitations of early reporting for symptom based diagnosis, variations in natural language by data source, language translation and bias, and scale of big data.
Maturity of technology TRL 6
Research Area CBA-03 Next Generation Analytic Capabilities for BSV - TA 1 (Chemical/Biological)

Major goals
- BSVE interface to GRITS developed with SDK
- Near-real-time disease diagnostic capabilities
- Network of experts connected to BSVE via GRITS
- Big data search, filtering, and recommendation powered by GRITS diagnostic tools

Cost $2.1M per annum

Period of Performance 36 months

Contact Information Dr. Nico Preston; +1-212-380-4473
preston@ecohealthalliance.org

Global Rapid Identification Tool System (GRITS)
Statement of Work
May 7, 2014

1.0 - Objective:

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:

The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:

1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowdsource annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
5. Crowdsource improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Create a web-crawler for expanding coverage of disease reports
9. Forecast disease emergence

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:

Task 1: Connect GRITS Girder database to the BSVE (Year 1)

1. Solicit feedback on GRITS data API from BSVE team

2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing

1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Test diagnostic dashboard with expert communities

1. Enhance and test dashboard UI for providing feedback
2. Write documentation of dashboard and provide to ProMED and HealthMap
3. Have editors test annotation dashboard and summarize their feedback
4. Incorporate changes or develop plan to make changes later

Task 8: Enhance the expert annotation interface (Year 2)

1. Write documentation of annotation interface and provide to experts
2. Have editors test annotation interface and summarize their feedback
3. Incorporate changes or develop plan to make changes later
4. Develop new forms of annotation that are less error prone and better inform text-mining and diagnostic algorithms.

Task 9: Build mechanisms to crowdsource annotations

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 10: Incorporate disease network graphs to assist diagnostics

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blindspots' in the information network

Task 11: Support diagnostic algorithm development with dashboard

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 12: Expand diagnostic capability to arbitrary data feeds

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 13: Connect GRITS to GRID

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 14: Update diagnostic model in near-real-time

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 15: Use text mining to extend network graphs/ontologies

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 16: Crowdsource improvements to the GRITS media diagnostic tool (Year 3)

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 17: Connect GRID collective intelligence editor to the BSVE

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface

6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 18: Connect GRITS diagnostic data filtering to the BSVE

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 19: Enrich diagnostic dashboard with dynamic visualizations

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 20: Generate disease summary reports from diagnostics

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 21: Connect EcoHD to GRITS recommendations

1. Evaluate existing EcoHD API against needs of recommendation system
2. Implement changes to EcoHD API
3. Use tags or metadata to identify relevance of EcoHD data sources

Task 22: Create a web-crawler for expanding coverage of disease reports

1. Build a web crawler for DTRA priority infectious diseases
2. Build a submission interface for users to submic urls
3. Test and evaluate and web crawler and global coverage
4. Close the loop with data partners by sharing new resources through API

Task 23: Forecast disease emergence

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports

- Monthly Status Reports (36)
- Monthly Cost Status Reports (36)
- Quarterly Status Reports (12)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics
    - (V.5.4) - Crowdsourcing module for gathering additional training data
    - (V.5.5) - Web crawler that searches the web for EID reports
    - (V.5.6) - Disease forecast reports
- Miscellaneous data submissions:

1. Feedback on diagnostic dashboard
2. Crowdsourced labels and annotations
3. EcoHD data for drivers of infectious disease

- Documentation:

1. Documentation on near-real-time architecture
2. Documentation for GRITS APIs

SupplementalInfo

Go Back to Dashboard

DUNS, TIN, NAICS

DUNS:	77090066
TAX ID:	31-1726494

Certifications and Representations:

SAM registration completed?:	Yes
Certifications and Representations:?	Yes

Human Subjects:

Proposed research involves human subjects or materials?	No

Animal Use:

Proposed research involves animal studies or animal work?	No

Biosurety and Select Agency Use:

Proposed research involves Select Agent?	No

Organizational Conflict of Interest Advisory:

Does a Conflict of Interest exist?	Yes
Outline Use:	EcoHealth Alliance is currently under contract with the Defense Threat Reduction Agency/J4C, administered through the Office of Naval Research. (Contract No. HDTRA1-13-C-0029) until July 17, 2014.

Intangible Property Assertions:

Any IP use or restrictions?	No

Recommended contract Type and Pricing Arrangement with Rationale:

Procurement instrument?	contract
Pricing Arrangement?	cost
Rationale:	EcoHealth Alliance recommends the use of a â€œCost Reimbursement Contractâ€? as specified in section 16.301-3 of the Federal Acquisition Regulations. The maximum contract amount would consists of a budget for direct cost plus an overhead allocation based on the most recently federally approved indirect cost rate. The rationale for this choice is that it is consistent with the payment methodology of other federal grants awarded to EcoHealth Alliance and the financial management systems of EcoHealth Alliance.

Statement of Current and Pending Support:

Any Current or pending support?:	Yes
Outline Use:	Dr. Nicholas Preston, PI Pending Research Support Next Generation Analytic Capabilities for BSV HDTRA114-AMD1-CBA-03-2-0022 Role: PI Funding Agency: DTRA BSVE Data Challenge HDTRA114-AMD1-CBA-05-2-0021 Role: PI Funding Agency: DTRA Current Research Support Global Rapid Identification Tool System (GRITS) for Undiagnosed EID Events, PI: Preston 07-009-7096-52291 Role: PI Dates: 1/2013-present Funding Agency: DTRA Dr. Preston is the PI for this collaborative initiative to develop a model-driven web application for biosurveillance analysts to diagnosis digital infectious disease reports. He conducts the technical project management and supervises both the data scientists developing the machine learning algorithms and software developers building the web application. PREDICT, PI: Morse Role: Project Director Dates: 12/2011-present

Funding Agency: USAID
Dr. Preston develops the Sicki Project, a repository of historical EID information through investigative surveys of experts; data mining the web and scientific literature; and building web portals for collective intelligence and collaboration in EID research.

DCMA/ONR/DFAS/DCAA Representatives:

(required for all except universites)	DFAS COLUMBUS CENTER -- HQ0337
(required for universites)	2
DFAS: (required by all)	Yes
	3

Confirmed Proposal Expiration Date:

Proposal and costs are firm until: (award date stated in BAA or 270 days after receipt)	5/7/2015 12:00:00 AM

Volume III: Supplemental Information

Global Rapid Identification Tool System (GRITS)
CBA-03, Dr. Nico Preston, EcoHealth Alliance

Objective Leverage the GRITS platform to deliver real-time disease diagnostics and data filtering to the BSVE, powered by GRITS analytics, visualizations, data, and experts from OneHealth, EcoHealth, and Open Source communities.

Description of effort We developed the GRITS diagnostic platform with support from DTRA and propose to connect the system with the BSVE, as follows:
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- Scale GRITS to return near-real-time diagnostics
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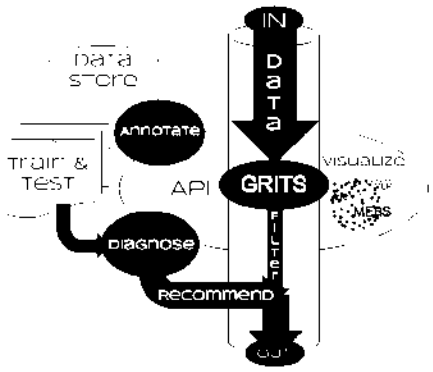
- Leverage diagnostics to filter and recommend data to BSVE
- Expand and integrate diagnostic visualizations in the BSVE



Benefits of proposed technology
-Early warning of microbial threats
-Filtering to increase data feed relevance for analysts -Near-real-time differential diagnosis
-Enhanced decision support and data processing for BSVE
-Improved visualization through reactive web technology
-Increased network of experts and collective intelligence
Challenges Limitations of early reporting for symptom based diagnosis, variations in natural language by data source, language translation and bias, and scale of big data.
Maturity of technology TRL 6
Research Area CBA-03 Next Generation Analytic Capabilities for BSV - TA 1 (Chemical/Biological)

Major goals
- BSVE interface to GRITS developed with SDK
- Near-real-time disease diagnostic capabilities
- Network of experts connected to BSVE via GRITS
- Big data search, filtering, and recommendation powered by GRITS diagnostic tools

Cost $2.1M per annum

Period of Performance 36 months

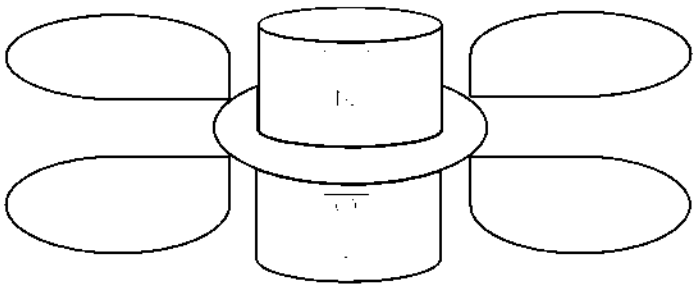
Contact Information Dr. Nico Preston; +1-212-380-4473
preston@ecohealthalliance org

1) Updated White Paper

HDTRA1-14-CHEM-BIO-BAA
CBA-03 Next Generation Analytic Capabilities for BSV
"Global Rapid Identification Tool System (GRITS)" EcoHealth Alliance

Objective
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, previously developed with DTRA support, and expand it to deliver near-real-time disease diagnostics and data processing to the BSVE. These capabilities will be powered by GRITS analytics, visualizations, and data, and connected to a network of experts from One Health, EcoHealth, and Open Source communities.

Description of the Effort
The growth of data from both instrumentation and the web presents an emerging challenge to biosurveillance analysts. To tackle this, we are optimizing our surveillance efforts by taking a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS is designed to ingest and process an unstructured data feed:



GRITS Data Processing:
- Mine (Extract)
- Diagnose (Identify)
- Recommend (Expand)
- Filter (Reduce)
- Connect (Relate)

Post-processing, GRITS returns a mined set of relevant data and words; a ranked differential diagnosis; a collection of recommended reports, historic events, and EcoHealth data; a filtered data subset informed by diagnostic targets; and connections to other bioevents and underlying network structures (e.g. geography, time, information, diseases, and environmental drivers).

We propose scaling this system to handle large data volumes in near-real-time, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases, bioevents, or symptoms of interest. GRITS enhances traditional search with adaptive diagnostic models that are trained on data collections curated by our communities of experts and are capable of identifying documents of relevance to a disease of interest. These diagnostic filters reduce the complexity and increase the specificity of the data feed to an analyst's workflow. Additionally, this approach may be leveraged to identify unusual events and diagnostic gaps that may herald an emerging

infectious disease of unknown etiology.

GRITS diagnostic are trained on a broad spectrum of resources from partnerships with leading providers in the EcoHealth, One Health, and Open Source communities. Our network of experts includes ProMED-mail, HealthMap, Kitware Inc., and EcoHealth Alliance. To ensure diagnosis in the early stages of emergence, we blend social media, news media, and scientific literature, along with:

- **Collective intelligence:** crowdsourcing annotation and human intelligence tasks
- **Experts:** elicitation, consultation, and peer review
- **Automation**: data mining, machine learning, and natural language processing.

Through our Global Repository of Infectious Disease (GRID) project, EHA has curated media and data for historic bioevents. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities. Lastly, our tools are integrated with our EcoHealth Data (EcoHD), a warehouse of global open source data, including climate, ecological, demographic datasets.

Benefits of the Proposed Technology

- Early warning of microbial threats
- Filtering to increase data feed relevance for analysts -Near-real-time differential diagnosis
- Enhanced decision support and data processing for BSVE
- Improved visualization through reactive web technology
- Increased network of experts and collective intelligence.

Technical Challenges

It is difficult to diagnose diseases in the early phase of an outbreak due to incomplete reporting. Natural language varies among news, scientific literature, and social media data sources. News aggregators have a strong western bias, resulting in media dark spots in hotspots of disease emergence. Open source media data has an English language bias, requiring non-latin character support and translation, and the volume of relevant data is continually increasing.

TRL of the technology: TRL 6

Major Goals/Milestones by fiscal year

Year 1 - Develop app (via SDK) to connect GRITS diagnostics and data to BSVE
Year 2 - Deploy near-real-time architecture to support live diagnostic dashboard in BSVE app
Year 3 - Integrate network of EcoHealth and One Health experts via BSVE app

2) Statement of Work

Global Rapid Identification Tool System (GRITS)
Statement of Work
May 7, 2014

1.0 - Objective:

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:

The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

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2. Build mechanisms to crowdsource annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
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3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:

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4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Test diagnostic dashboard with expert communities

1. Enhance and test dashboard UI for providing feedback
2. Write documentation of dashboard and provide to ProMED and HealthMap
3. Have editors test annotation dashboard and summarize their feedback
4. Incorporate changes or develop plan to make changes later

Task 8: Enhance the expert annotation interface (Year 2)

1. Write documentation of annotation interface and provide to experts

2. Have editors test annotation interface and summarize their feedback
3. Incorporate changes or develop plan to make changes later
4. Develop new forms of annotation that are less error prone and better inform text-mining and diagnostic algorithms.

Task 9: Build mechanisms to crowdsource annotations

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 10: Incorporate disease network graphs to assist diagnostics

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blindspots' in the information network

Task 11: Support diagnostic algorithm development with dashboard

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 12: Expand diagnostic capability to arbitrary data feeds

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 13: Connect GRITS to GRID

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 14: Update diagnostic model in near-real-time

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 15: Use text mining to extend network graphs/ontologies

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 16: Crowdsource improvements to the GRITS media diagnostic tool (Year 3)

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 17: Connect GRID collective intelligence editor to the BSVE

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs

2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 18: Connect GRITS diagnostic data filtering to the BSVE

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 19: Enrich diagnostic dashboard with dynamic visualizations

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 20: Generate disease summary reports from diagnostics

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 21: Connect EcoHD to GRITS recommendations

1. Evaluate existing EcoHD API against needs of recommendation system
2. Implement changes to EcoHD API
3. Use tags or metadata to identify relevance of EcoHD data sources

Task 22: Create a web-crawler for expanding coverage of disease reports

1. Build a web crawler for DTRA priority infectious diseases
2. Build a submission interface for users to submic urls
3. Test and evaluate and web crawler and global coverage
4. Close the loop with data partners by sharing new resources through API

Task 23: Forecast disease emergence

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports
- Monthly Status Reports (36)
- Monthly Cost Status Reports (36)
- Quarterly Status Reports (12)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics

(V.5.4) - Crowdsourcing module for gathering additional training data
(V.5.5) - Web crawler that searches the web for EID reports
(V.5.6) - Disease forecast reports

- Miscellaneous data submissions:
  1. Feedback on diagnostic dashboard
  2. Crowdsourced labels and annotations
  3. EcoHD data for drivers of infectious disease
- Documentation:
  1. Documentation on near-real-time architecture
  2. Documentation for GRITS APIs

3) DUNS, TIN, & NAICS

DUNS: 077090066

TIN: 31-1726494

NAICS
541690: Other Scientific and Technical Consulting Services
541940: Veterinary Services
541990: All Other Professional, Scientific, and Technical Services
813312: Environment, Conservation and Wildlife Organizations

4) Letter of Intent from DoD or DoE Lab

This is not applicable to EcoHealth Alliance.

5) System for Award Management (SAM)

EcoHealth Alliance is registered in the SAM database and will keep its registration current for the life of the contract.

6) Certifications and Representations

The below provisions are not contained in the SAM database.

DFARS 252.203-7000 Requirements Relating to Compensation of Former DoD Officials.

DFARS 252.203-7005 Representation Relating to Compensation of Former DoD Officials.

DFARS 252.209-7997 Representation by Corporations Regarding an Unpaid Delinquent Tax Liability or a Felony Conviction Under Any Federal Law-DoD Appropriations (Deviation 2013-O0006)

EcoHealth Alliance acknowledges and understands each provision and will comply as necessary.

Regarding FAR 52.209-7, we are aware of this requirement and will comply as necessary.

Our SOW contains no proprietary data or restrictive markings, and if we are awarded a contract, we consent to the potential public release of our Statement of Work.

EcoHealth Alliance has no FFRDC sponsor.

EcoHealth Alliance is not a DoE FFRDC participant.

7) Human Subjects

No human subjects will be used so this is not applicable to our application.

8) Animal Use

No animal subjects will be used so this is not applicable to our application.

9) Biosurety, Select Agent and Chemical Agent Use: N/A

No select agents will be used so this is not applicable to our application.

10) Organizational Conflict of Interest Advisory

EcoHealth Alliance is currently under contract with the Defense Threat Reduction Agency/J4C, administered through the Office of Naval Research, (Contract No. HDTRA1-13-C-0029) until July 17, 2014.

11) Intellectual Property

There are no known patents, patent applications, or inventions which the Offeror may be required to license in order to perform the work described in the Offeror's proposal, or which the Government may be required to license to make or use the deliverables of the contract should the Offeror's proposal be selected for award.

12) List of Patents

There are no known patents, patent application, or inventions.

13) Data Rights Assertion List

The Offeror asserts for itself that the Government's rights to use, release, or disclose the following technical data or computer software is furnished without restrictions.

14) EVMS Information

This proposal does not have an estimated total dollar value greater than $20 million.

15) Subcontracting Plan

Per FAR 19.702, we have detailed below our individual subcontracting plan to maximize small business potential in our contracting efforts.

The total amount of dollars to be subcontracted for this proposal is **$3,178,829.03**. To reflect current DoD percentage goals, we set a goal of thirty percent (approximately **$954,000**) of subcontracted dollars specifically for small businesses.

The breakdown of our percentage goals for subcontracted dollars is as follows:

Small Business - 20% (DoD goal: 36.7%)
HUB Zone Small Business - 2% (DoD goal: 3%)
Small Disadvantaged Business - 3% (DoD goal: 5%)
Women-Owned Small Business Concerns - 3% (DoD goal: 5%)
Service-Disabled Veteran Owned Small Business - 2% (DoD goal: 3%)

We set the total and categorical percentage goals lower than DoD goals due to the specialized work to be contracted for this proposal and the historic collaborations and seed project off of which this proposal is developed.

The principal work contracted for this proposal is technical expertise in machine learning, text analysis, software development, data management, and data visualization, as well as expertise in digital disease surveillance, disease reporting expertise, global health data collection, disease report moderating, disease modeling, as well as news and social media analysis specific to disease threats.

With the above subcontracting opportunities in mind, EcoHealth Alliance gave careful consideration to small businesses that could provide the full array of services we require. On this basis, we identified two recognized small business entities in the field (Kitware and Epidemico) that had the ability and the capacity to accomplish the majority of these goals and that would be able to compliment the expertise of our organization to accomplish the tasks

detailed in our statement of work (SOW). Per FAR 19.703 (2)(b), we rely on written documentation to confirm a subcontractor's status as a small business.

Furthermore, due to the scientifically specific nature of the work we propose, we were unable, to the best of our knowledge, to identify areas of the work that we could further subcontracted or qualified firms that could help us achieve our broader small business goals (e.g. veteran, disadvantaged, HUB, women, disabled).

Supplies and services to be contracted to Kitware includes machine learning, text analysis, software development, data management, and data visualization. Epidemico has recognized expertise in disease surveillance, disease reporting expertise, disease modeling, as well as news and social media analysis for disease threats. Both entities are unique scientific organizations, selected on the basis of the nature of the work, good faith efforts to identify capable small business firms, and the precedent of successful prior collaborations with EcoHealth Alliance. Specifically, they were selected on the basis of professional accomplishments, niche expertise, proven track record, and the precedent of previously having developed custom biosurveillance products to interfaced with their products and expertise.

Beyond the specific goals of this proposal, EcoHealth Alliance will make every effort to provide opportunities for small business through our current mechanisms for entering into professional services.

The internal identification and selection process for subcontractors are as follows:

1. Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions.
2. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to determine their capacity, and their local relationships. Extensive review includes CV's of principal investigators and their staff, organizational and administrative capacity, annual report and audit report reviews, indirect cost rate review, and history of the institution.
3. We conduct a complete review of prospective subcontractors among senior staff, with a recommendation to the President for final decision.

The total for contract awards to Kitware and Epidemico is **$2,782,947.69** which equals approximately eighty eight percent (88%) of total subcontracted dollars, surpassing our original percentage goals for small businesses. Indirect costs were not included in our goals, and both Epidemico and Kitware have their own approved overhead rates.

Based upon the above criteria, we have selected our small business contractors in accordance with our plan. We are committed to the small business goals as outlined in FAR 19.702 and will continue to administer our subcontracting program, inclusive of contractual agreements and

monthly invoices and reports, in accordance with these regulations. The person who administers these requirements is the administrative point of contract for the project. Per DTRA's request, we will submit the ISR and SSR for evaluation compliance if necessary.

EcoHealth Alliance does assure that we will cooperate in any studies or surveys required, and we will include the relevant flow-down clauses in awards to subcontractors.

- **52.219-8 9 (Utilization of SB concerns)**
- **52.219-9 (Subcontracting Plan)**

16) Recommended Contract/Pricing Arrangements and Rationale

EcoHealth Alliance recommends the use of a "Cost Reimbursement Contract" as specified in section 16.301-3 of the Federal Acquisition Regulations. The maximum contract amount would consists of a budget for direct cost plus an overhead allocation based on the most recently federally approved indirect cost rate.

The rationale for this choice is that it is consistent with the payment methodology of other federal grants awarded to EcoHealth Alliance and the financial management systems of EcoHealth Alliance.

17) Authorized Negotiators

Principal Investigator: Nicholas Preston, Ph.D.
Director, Data Science and Research Technology
EcoHealth Alliance
460 West 34th Street - 17th floor
New York, NY 10001
preston@ecohealthalliance.org
1.212.380.4497 (direct)
1.212.380.4465 (fax)

BPOC: Aleksei Chmura
Program Coordinator
EcoHealth Alliance
460 West 34th Street - 17th floor
New York, NY 10001
chmura@ecohealthalliance.org
1.212.380.4473 (direct)
1.212.380.4465 (fax)

Contractual Obligator: Peter Daszak, Ph.D.

President, EcoHealth Alliance
EcoHealth Alliance
460 West 34th Street - 17th floor
New York, NY 10001
daszak@ecohealthalliance.org
1.212.380.4460 (direct)
1.212.380.4465 (fax)

18) Statement of Current and Pending Support

Dr. Nicholas Preston, PI

Pending Research Support

Next Generation Analytic Capabilities for BSV
HDTRA114-AMD1-CBA-03-2-0022
Role: PI
Funding Agency: DTRA

BSVE Data Challenge
HDTRA114-AMD1-CBA-05-2-0021
Role: PI
Funding Agency: DTRA

Current Research Support

Global Rapid Identification Tool System (GRITS) for Undiagnosed EID Events, PI: Preston
07-009-7096-52291
Role: PI
Dates: 1/2013-present
Funding Agency: DTRA
Dr. Preston is the PI for this collaborative initiative to develop a model-driven web application for biosurveillance analysts to diagnosis digital infectious disease reports. He conducts the technical project management and supervises both the data scientists developing the machine learning algorithms and software developers building the web application.

PREDICT, PI: Morse
Role: Project Director
Dates: 12/2011-present
Funding Agency: USAID

Dr. Preston develops the Sicki Project, a repository of historical EID information through investigative surveys of experts; data mining the web and scientific literature; and building web portals for collective intelligence and collaboration in EID research.

Completed Research Support

Canepi: A biosurveillance ecosystem in the cloud, PI: Karesh
N66001-13-C-2024
Role: Technical Lead
Dates:12/2012-7/2013
Funding Agency: DTRA

Canepi is a cloud-based biosurveillance ecosystem designed to support a rapid detect-identify-respond lifecycle of emerging diseases. Dr. Preston led the technical team developing the web platform and coordinating with the algorithm developers and data providers.

Skoll Global Threats Fund, PI: Preston
Role: PI
Dates: 4/2012-9/2012
Funding Agency: Skoll Foundation

Dr. Preston developed global data sets and visualizations of global threat in a web application. The team deployed the maps with our open source WiggleMaps (WebGL) visualization environment for dynamic and interactive maps. The gridded data sets included wildlife, human demographics, conflict, vector borne disease, migration, livestock, extractive industry, temperature and precipitation.

dotSkapes Virtual Laboratory (dVL), PI: Patz
Role: Project Director
Dates: 9/2009-9/2011
Funding Agency: Gottesman Fund

Dr. Preston designed and developed dotSkapes, a virtual laboratory that leveraged advances in web technology to reduce barriers to collaboration, thereby making it easier to find, analyze, organize, and share research. The platform was designed to quickly connect users with relevant resources (e.g., people, data, and analytical tools) via search engines trained on the scientific literature. The team used an interactive geographic interface to visualize complex datasets.

19. ATTACHMENT 11 – STANDARD FORM 1408

Preaward Survey of Prospective Contractor Accounting System Checklist

Instructions:
1. Mark "X" in the appropriate column.
2. Provide a narrative describing how the current accounting system supports your response to each item.

Contractor Name:	EcoHealth Alliance
Point of Contact:	Harvey Kasdan, CFO
CAGE Code:	3MMU3
DUNS Code:	077090066

	Yes	No	N/A	Note
1. Is the accounting system in accord with generally accepted accounting principles?	X			1
2. ACCOUNTING SYSTEM PROVIDES FOR:				
a. Proper segregation of direct costs from indirect costs.	X			2
b. Identification and accumulation of direct costs by contract.	X			3
c. A logical and consistent method for the allocation of indirect costs to intermediate and final cost objectives. (A contract is final cost objective.)		X		4
d. Accumulation of costs under general ledger control.	X			5
e. A timekeeping system that identifies employees' labor by intermediate or final cost objectives.		X		6
f. A labor distribution system that charges direct and indirect labo to the appropriate cost objectives.		X		7

g. Interim (at least monthly) determination of costs charged to a contract through routine posting of books of account.	X			8
h. Exclusion from costs charged to government contracts of amounts which are not allowable in terms of FAR 31, Contract Cost Principles and Procedures, or other contract provisions.	X			9
i. Identification of costs by contract line item and by units (as if each unit or line item were a separate contract) if required by the proposed contract.		X		10
j. Segregation of preproduction costs from production costs.		X		11
3. Accounting system provides financial information:				
a. Required by contract clauses concerning limitation of cost (FAR 52.232-20 and 21) or limitation on payments (FAR 52.216-16).		X		12
b. Required to support requests for progress payments.	X			13
4. Is the accounting system designed, and are the records maintained in such a manner that adequate, reliable data are developed for use in pricing follow-on acquisitions?	X			14
5. Is the accounting system currently in full operation? (If not, describe in Page 2 narrative which portions are (1) in operation, (2) set up, but not yet in operation, (3) anticipated, or (4) nonexistent.)	X			15

Instruction: Use this section to explain how the current accounting system supports your response to each item. If a response is N/A provide further explanation. Use as much space as needed. Provide references to current policies and procedures if applicable.

Note	Narrative
1	EcoHealth Alliance manages all costs in accord with GAAP as it relates to non-profit organizations.
2	All costs are properly coded to a specific Project, Funding Source, and General Ledger category. Purchased items must be reviewed and approved before the invoice is paid.
3	Each contract is assigned a unique project number when a grant is awarded. All direct costs (salaries, benefits and vendor payables) incurred in the performance of the contract is coded to that number
4	Indirect costs are calculated via Excel spreadsheet and entered into the general ledger through a journal entry. The indirect cost rate is based on the approved contrac budget.
5	All costs are treated the same regardless of funding source. They must be authorized by the contract manager of their approved subordinate and be consistent with the signed contract.
6	The timekeeping system is not part of the accounting system. Timesheets are in Excel format and are signed by the employee each month. Time allocations are applie to salaries and entered via journal entry for each project. The system considers each contract a separate cost objective.
7	Direct and indirect costs are charged to each contract via discrete coding of project and general ledger categories.
8	All projects costs are reviewed by the project manager each month to identify coding errors and to measure the progress of the contract against contract objectives.
9	All costs that are prohibited by the contract or other federal law are removed from the project ledger and charged to “unrestricted funds.”
10	There are separate general ledger lines for each contract item in the approved budget The system however, does not record units of items purchased. This information can be added via a transaction description.

11	Preproduction costs not authorized by the contract would be considered non-reimbursable. Production costs, delineated by the contract start date would be included in contract costs so long as they are authorized by the contract budget.
12	The accounting system does not contain information regarding the total value of the contract. That is monitored via Excel analysis.
13	All requests for payments are supported by the general ledger.
14	The general ledger is audited each year by an independent audit firm in accord with th requirement of OMB Circulars A-122 and A-133. EHA has not been cited for any material deficiencies over the last three years.
15	The accounting system is in full operation and is regularly updated when instructed by the software vendor.

20) Forward Pricing Rate Agreement

All rates and bases by year can be found in the cost proposal and cost narrative.

21) Confirmed Proposal Expiration date

EHA holds the proposal, to include proposed costs, firm for one year after receipt.

22) Exception Statement to FAR Clauses

EHA has reviewed these clauses in preparation of a resulting award.

Per FAR 19.702, we have detailed below our individual subcontracting plan to maximize small business potential in our contracting efforts.

The total amount of dollars to be subcontracted for this proposal is **$3,178,829.03**. To reflect current DoD percentage goals, we set a goal of thirty percent (approximately **$954,000**) of subcontracted dollars specifically for small businesses.

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capable small business firms, and the precedent of successful prior collaborations with EcoHealth Alliance. Specifically, they were selected on the basis of professional accomplishments, niche expertise, proven track record, and the precedent of previously having developed custom biosurveillance products to interfaced with their products and expertise.

Beyond the specific goals of this proposal, EcoHealth Alliance will make every effort to provide opportunities for small business through our current mechanisms for entering into professional services.

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1. Senior scientists survey and interview institutions and individuals recommended by our science staff, colleagues, industry groups, funders and, for in-country partner recommendations, local, regional and national governments and institutions.
2. Site visits are made as necessary, particularly for partners with whom we have not worked previously, to determine their capacity, and their local relationships. Extensive review includes CV's of principal investigators and their staff, organizational and administrative capacity, annual report and audit report reviews, indirect cost rate review, and history of the institution.
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EcoHealth Alliance does assure that we will cooperate in any studies or surveys required, and we will include the relevant flow-down clauses in awards to subcontractors.

- **52.219-8 9 (Utilization of SB concerns)**
- **52.219-9 (Subcontracting Plan)**

This does not apply as we achieved our small business goals listed in our plan.

EHA Budget	Year 1	
Direct Labor	*Rate (hour)*	*Quantity (hours)*
PI Dr. Nico Preston (Director)	$67.00	1560
Senior Data Scientist (III)	$48.00	2080
Data Scientist (II)	$46.35	1040
Data Scientist (II)	$46.35	1040
Lead Developer (III)	$47.00	2080
Research Scientist (II)	$24.00	1560
Research Assistant (I)	$18.19	2080
Program Coordinator (II)	$24.72	2080
Total Direct Labor		13520
Fringe Benefits	0.323	
Total Labor		
	Cost	*Quantity*
Travel		
1 person to Boston (HealthMap & ProMED)	$596.50	2.00
1 person to North Carolina (Kitware)	$457.00	2.00
2 people to Clifton Park, NY (Kitware)	$725.00	2.00
2 people to DC (DTRA)	$1,401.00	2.00
2 people to Digital Disease Detection Conf.	$3,707.00	1.00
Materials & Equipment		*Quantity*
Cloud Processing	$1,000.00	12.00
Data purchasing	$200.00	12.00
Computer supplies	$330.00	12.00
Services		*Quantity*
Code hosting	$200.00	12.00
Data hosting	$156.79	12.00
Other expenses		*Quantity*
Meeting support	$250.00	2.00
Recruiting costs	$0.00	0.00
Publication costs	$2,250.00	2.00
Total Materials & Equipment		
Subcontractor Costs	*Rate (hour)*	*Quantity*
Kitware		
Dr. J.Baumes (47.49)	$48.22	835.19
Patrick Reynolds (49.34)	$44.81	835.19
R&D Engineer (43.92)	$44.31	1,182.22
R&D Engineer (43.92)	$44.31	1,182.22
1 trip to NYC for 2 people	$806.00	2.00
1 trip to DC for 2 people	$1,242.00	2.00
Indirect Costs	0.828	
General & Administrative	0.384	
7% profit fee		
		Subtotal

Epidemico (Healthmap)		
Dr. J. Brownstein	$77.25	800.00
Clark Freifeld, Senior Programmer	$55.00	800.00
Harold Rodriguez, Programmer	$37.55	1,880.00
Kate O'Brien, Front-end Software Developer	$32.19	1,760.00
Chi Bahk, Project Manager	$29.51	1,880.00
Carrie Pierce, Data Curator	$29.51	1,880.00
HealthMap License Fee		
1 trip to NYC for 2 people	$1,500.00	2.00
1 trip to DC for 2 people	$1,342.00	2.00
Indirect Costs	0.10	
		Subtotal
ISID (ProMED-mail)		
L. Madoff - Editor	$88.70	192.00
D. Tenenholz - IT Man.	$48.83	306.00
Fringe Benefits		0.30
Consultant - M. Pollack - Deputy Editor	$78.85	200.00
Consultant - Associate Editor	$22.15	1,970.00
Consultant - Copy Editor	$29.50	160.00
1 trip to NYC for 2 people	$1,500.00	2.00
1 trip to DC for 2 people	$1,342.00	2.00
Indirect Costs	0.15	
		Subtotal
Total Subcontractor Costs	Rate	
Total Direct Costs		
Modified Direct Costs		
Total F&A	0.441	
Total Cost		

Year 1 Total	Year 2		Year 2 Total	Y
	Rate (hour)	*Quantity (hours)*		*Rate (hour)*
$104,520.00	$69.01	1560	$107,655.60	$71.08
$99,840.00	$49.44	2080	$102,835.20	$50.92
$48,204.00	$47.74	1040	$49,650.12	$49.17
$48,204.00	$47.74	1040	$49,650.12	$49.17
$97,760.00	$48.41	2080	$100,692.80	$49.86
$37,440.00	$24.72	1560	$38,563.20	$25.46
$37,835.20	$18.74	2080	$38,970.26	$19.30
$51,417.60	$25.46	2080	$52,960.13	$26.23
$525,220.80		13520	$540,977.42	
$169,646.32	0.328		$177,440.60	0.333
$694,867.12			$718,418.02	
	Cost	*Quantity*		*Cost*
$1,193.00	$614.40	2.00	$1,228.79	$632.83
$914.00	$470.71	2.00	$941.42	$484.83
$1,450.00	$746.75	2.00	$1,493.50	$769.15
$2,802.00	$1,443.03	2.00	$2,886.06	$1,486.32
$3,707.00	$0.00	0.00	$0.00	$0.00
		Quantity		
$12,000.00	$1,000.00	12.00	$12,000.00	$1,000.00
$2,400.00	$200.00	12.00	$2,400.00	$200.00
$3,960.00	$330.00	12.00	$3,960.00	$330.00
		Quantity		
$2,400.00	$200.00	12.00	$2,400.00	$200.00
$1,881.48	$156.79	12.00	$1,881.48	$156.79
		Quantity		
$500.00	$250.00	2.00	$500.00	$250.00
$0.00	$550.00	1.00	$550.00	$550.00
$4,500.00	$2,250.00	2.00	$4,500.00	$2,250.00
$37,707.48			$34,741.25	
	Rate (hour)	*Quantity*		*Rate (hour)*
$40,272.86	$49.67	835.19	$41,481.05	$51.16
$37,424.86	$46.15	835.19	$38,547.61	$47.54
$52,384.17	$45.64	1,182.22	$53,955.69	$47.01
$52,384.17	$45.64	1,182.22	$53,955.69	$47.01
$1,612.00	$830.18	2.00	$1,660.36	$855.09
$2,484.00	$1,279.26	2.00	$2,558.52	$1,317.64
$154,473.39	0.828		$159,107.59	0.828
$130,957.61	0.384		$134,886.34	0.384
$33,039.51			$34,030.70	
$505,032.58			$520,183.55	

$61,800.00	$79.57	800.00	$63,654.00	$81.95
$44,000.00	$56.65	800.00	$45,320.00	$58.35
$70,594.00	$38.68	1,880.00	$72,711.82	$39.84
$56,654.40	$33.16	1,760.00	$58,354.03	$34.15
$55,478.80	$30.40	1,880.00	$57,143.16	$31.31
$55,478.80	$30.40	1,880.00	$57,143.16	$31.31
$10,000.00			$10,000.00	
$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35
$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73
$35,969.00	0.10		$37,018.07	0.10
$395,659.00			$407,198.77	
$17,030.40	$91.36	192.00	$17,541.31	$94.10
$14,941.98	$50.29	306.00	$15,390.24	$51.80
$9,591.71	0.30		$9,879.47	0.30
$15,770.00	$81.22	200.00	$16,243.10	$83.65
$43,635.50	$22.81	1,970.00	$44,944.57	$23.50
$4,720.00	$30.39	160.00	$4,861.60	$31.30
$3,000.00	$1,545.00	2.00	$3,090.00	$1,591.35
$2,684.00	$1,382.26	2.00	$2,764.52	$1,423.73
$16,706.04	0.15		$17,207.22	0.15
$128,079.63			$131,922.02	
$1,028,771.21	Rate		$1,059,304.35	
$1,761,345.81			$1,812,463.61	
$807,574.60			$828,159.27	
$356,140.40	0.441		$365,218.24	0.441
$2,117,486.21			$2,177,681.85	

'ear 3	Year 3 Total	TOTAL
Quantity (hours)		
1560	$110,885.27	$323,060.87
2080	$105,920.26	$308,595.46
1040	$51,139.62	$148,993.74
1040	$51,139.62	$148,993.74
2080	$103,713.58	$302,166.38
1560	$39,720.10	$115,723.30
2080	$40,139.36	$116,944.82
2080	$54,548.93	$158,926.66
13520	$557,206.75	$1,623,404.97
	$185,549.85	$532,636.76
	$742,756.59	$2,156,041.73
Quantity		
2.00	$1,265.65	$3,687.44
2.00	$969.66	$2,825.08
2.00	$1,538.31	$4,481.81
2.00	$2,972.64	$8,660.70
0.00	$0.00	$3,707.00
Quantity		
12.00	$12,000.00	$36,000.00
12.00	$2,400.00	$7,200.00
12.00	$3,960.00	$11,880.00
Quantity		
12.00	$2,400.00	$7,200.00
12.00	$1,881.48	$22,577.76
Quantity		
2.00	$500.00	$1,500.00
1.00	$550.00	$1,100.00
2.00	$4,500.00	$13,500.00
	$34,937.74	$124,319.79
Quantity		
835.19	$42,725.48	$124,479.39
835.19	$39,704.04	$115,676.51
1,182.22	$55,574.36	$161,914.23
1,182.22	$55,574.36	$161,914.23
2.00	$1,710.17	$4,982.53
2.00	$2,635.28	$7,677.80
	$163,880.82	$477,461.79
	$138,932.93	$404,776.88
	$35,051.62	$102,121.83
	$535,789.06	$1,561,005.19

800.00	$65,563.62	$191,017.62
800.00	$46,679.60	$135,999.60
1,880.00	$74,893.17	$218,198.99
1,760.00	$60,104.65	$175,113.08
1,880.00	$58,857.46	$171,479.42
1,880.00	$58,857.46	$171,479.42
0.00	$10,000.00	$30,000.00
2.00	$3,182.70	$9,272.70
2.00	$2,847.46	$8,295.98
	$38,098.61	$111,085.68
	$419,084.73	$1,221,942.50
192.00	$18,067.55	$52,639.26
306.00	$15,851.95	$46,184.17
0.00	$10,175.85	$29,647.03
200.00	$16,730.39	$48,743.49
1,970.00	$46,292.90	$134,872.97
160.00	$5,007.45	$14,589.05
2.00	$3,182.70	$9,272.70
2.00	$2,847.46	$8,295.98
	$17,723.44	$51,636.70
	$135,879.68	$395,881.34
	$1,090,753.48	**$3,178,829.03**
	$1,868,447.81	$5,442,257.24
	$852,694.34	$2,488,428.20
	$376,038.20	$1,097,396.84
	$2,244,486.02	**$6,539,654.07**

	Alternate Titles	Monster (Salary)
Dr. Nico Preston (Director)	Data Management Director	$150,676.00
Program Coordinator (II)	Project administrator I	$52,998.00
Research Scientist (II)	Scientist II - Biotech	$103,989.00
Research Assistant (I)	Research and development associate I	$52,994.00
Senior Data Scientist (III)	Data Architect III	$118,558.00
Data Scientist (II)	Data Architect II	$106,455.00
Data Scientist (II)	Data Architect II	$106,455.00
Lead developer (II)	Software Developer III	$111,359.00

Monster (Rate)	Comparable %
72.44	95%
25.48	100%
49.99	49%
25.48	74%
57.00	87%
51.18	93%
51.18	93%
53.54	90%

http://monster.salary.com/
http://www1.salary.com/NY/New-York/Data-Management-Director-Salary.html
http://www1.salary.com/NY/New-York/Project-Administrator-I-Salary.html
http://monster.salary.com/salarywizard/Scientist-II-Biotech-Job-Description.aspx
http://www1.salary.com/NY/New-York/Research-and-Development-Associate-I-Salary.html
http://swz.salary.com/SalaryWizard/Data-Architect-III-Salary-Details-10001-New-York-NY.aspx
http://www1.salary.com/NY/New-York/Data-Architect-II-Salary.html
http://www1.salary.com/NY/New-York/Data-Architect-II-Salary.html
http://www1.salary.com/NY/New-York/Software-Developer-III-Salary.html

Global Rapid Identification Tool System (GRITS)
Statement of Work
May 7, 2014

1.0 - Objective:
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:
The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:
1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowdsource annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
5. Crowdsource improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Create a web-crawler for expanding coverage of disease reports
9. Forecast disease emergence

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:
Task 1: Connect GRITS Girder database to the BSVE (Year 1)
1. Solicit feedback on GRITS data API from BSVE team

2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing

1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Test diagnostic dashboard with expert communities

1. Enhance and test dashboard UI for providing feedback
2. Write documentation of dashboard and provide to ProMED and HealthMap
3. Have editors test annotation dashboard and summarize their feedback
4. Incorporate changes or develop plan to make changes later

Task 8: Enhance the expert annotation interface (Year 2)

1. Write documentation of annotation interface and provide to experts
2. Have editors test annotation interface and summarize their feedback
3. Incorporate changes or develop plan to make changes later
4. Develop new forms of annotation that are less error prone and better inform text-mining and diagnostic algorithms.

Task 9: Build mechanisms to crowdsource annotations

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 10: Incorporate disease network graphs to assist diagnostics

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blindspots' in the information network

Task 11: Support diagnostic algorithm development with dashboard

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 12: Expand diagnostic capability to arbitrary data feeds

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 13: Connect GRITS to GRID

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 14: Update diagnostic model in near-real-time

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 15: Use text mining to extend network graphs/ontologies

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 16: Crowdsource improvements to the GRITS media diagnostic tool (Year 3)

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 17: Connect GRID collective intelligence editor to the BSVE

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 18: Connect GRITS diagnostic data filtering to the BSVE

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 19: Enrich diagnostic dashboard with dynamic visualizations

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 20: Generate disease summary reports from diagnostics

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 21: Connect EcoHD to GRITS recommendations

1. Evaluate existing EcoHD API against needs of recommendation system
2. Implement changes to EcoHD API
3. Use tags or metadata to identify relevance of EcoHD data sources

Task 22: Create a web-crawler for expanding coverage of disease reports

1. Build a web crawler for DTRA priority infectious diseases
2. Build a submission interface for users to submic urls
3. Test and evaluate and web crawler and global coverage
4. Close the loop with data partners by sharing new resources through API

Task 23: Forecast disease emergence

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports
- Monthly Status Reports (36)
- Monthly Cost Status Reports (36)
- Quarterly Status Reports (12)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics
    - (V.5.4) - Crowdsourcing module for gathering additional training data
    - (V.5.5) - Web crawler that searches the web for EID reports
    - (V.5.6) - Disease forecast reports
- Miscellaneous data submissions:
    1. Feedback on diagnostic dashboard
    2. Crowdsourced labels and annotations

3. EcoHD data for drivers of infectious disease

- Documentation:
    1. Documentation on near-real-time architecture
    2. Documentation for GRITS APIs

Data Rights Assertion List

Technical data or computer software to be furnished with restrictions*	Basis for assertion**	Asserted rights category***	Name of person asserting restrictions****
None			

*For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such item, component, or process. For computer software or computer software documentation identify the software or documentation.

**Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions.

***Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses).

****Corporation, individual, or other person, as appropriate.

*****Enter "none" when all data or software will be submitted without restrictions.

Signature: _____ Date: 9/3/14

Printed Name: Harvey Kasdan

Title: Chief Financial Officer

Company Name: EcoHealth Alliance

APL Use Only:
Forward to APL Prime Contract Representative, Program Manager and Office of Patent Counsel.

COST SUMMARY

	Base Period			Option I								
Cost Element	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount	Rate Only	Quantity Hrs	Total Amount
Labor Category & Title							$	XX	$	$	XX	$
Lam, Xuan (Tom) Tester	$88.70	192	$17,030	$91.36	192	$17,541.31	%	XX	%	%	XX	%
[illegible] IT Manager	$15.53	366	$5,682	$30.24	366	$13,393.24	%	XX	%	%	XX	%
							%	XX	%	%	XX	%
							%	XX	%	%	XX	%
							%	XX	%	%	XX	%
TOTAL DIRECT LABOR		[illegible]	$31,972.56		[illegible]	$32,931.55		XX	%		XX	%
LABOR BURDEN	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount
FRINGE BENEFITS	30%	$31,972.56	$9,591.77	30%	$32,931.55	$9,879.47	%	%	%	%	%	%
OVERHEAD	%	%	%	%	%	%	%	%	%	%	%	%
TOTAL LABOR BURDEN			$9,591.77			$9,879.47			%			%
TOTAL MATERIAL EQUIPMENT			$[illegible]			$[illegible]			$			$
TOTAL TRAVEL COSTS			$[illegible]			$[illegible]			%			%
TOTAL ALL OTHER DIRECT COSTS			$[illegible]			$[illegible]			%			%
TOTAL SUBCONTRACTOR COSTS			$[illegible]			$[illegible]			$			$
TOTAL DIRECT COSTS			$[illegible]			$[illegible]			%			%
G&A + B&P + FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
G&A + B&P + FCCM	15.00%	$[illegible]	$[illegible]	15.00%	$[illegible]	$[illegible]	%	%	%	%	%	%
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach completed DD Form 1861)			$			$			%			%
TOTAL COSTS			$[illegible]			$[illegible]			%			%
FEE/PROFIT	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount	Fee Rate	Fee Rate Applied to (total cost, excluding travel & FCCM)	Total Amount
FEE/PROFIT	%	$	$	%	$	$	%	$	$	%	$	$
TOTAL COST PLUS FEE						$			$			$

MATERIALS/EQUIPMENT

Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Technical Information

Note:
Consumables may be listed as a lump sum if incremental items over $5,000. For these items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (EcoHealth Alliance)		Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$400.00	$284.00	$534.00	$120.00	$1,338.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$120.00
Total:	$120.00

Trip #:	2		Location:	Washington DC Area (DTRA and BSVI)		Contract Period	
Purpose:	Meet with DTRA and the BSVI team					Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
2	2		$600.00	$284.00	$534.00	$120.00	$1,338.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total
							$0.00

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
Consultant - M. Pollack, Deputy Editor	$15,720.00	Base Period	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $78.85 per hour.
Consultant - Associate Editor	$43,635.50	Base Period	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $22.15 per hour.
Consultant - Copy Editor	$4,614.40	Base Period	160 hours of work by a ProMed Copy Editor, calculated at a rate of $28.84 per hour.
Consultant - M. Pollack, Deputy Editor	$16,243.10	Option I	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $81.22 per hour.
Consultant - Associate Editor	$44,944.52	Option I	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $22.81 per hour.
Consultant - Copy Editor	$4,752.83	Option I	160 hours of work by a ProMed Copy Editor, calculated at a rate of $29.39 per hour.
Consultant - M. Pollack, Deputy Editor	16730.293	Option II	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $83.65 per hour.
Consultant - Associate Editor	$46,292.90	Option II	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $23.50 per hour.
Consultant - Copy Editor	$4,895.42	Option II	160 hours of work by a ProMed Copy Editor, calculated at a rate of $30.59 per hour.

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

COST SUMMARY

	Base Period			Option I			Option II								
Line Item	Rate Hrs	Quantity Hrs	Total Amount	Rate Hrs	Quantity Hrs	Total Amount	Rate Hrs	Quantity Hrs	Total Amount	Rate Hrs	Quantity Hrs	Total Amount	Rate Hrs	Quantity Hrs	Total Amount
Lead Engineer & Lead										N/A	XX	N/A	N/A	XX	N/A
Senior Mobile Developer	$82.50	40	$3,300	$84.98	40	$3,399.20	$87.53	40	$3,501.20	N/A	XX	N/A	N/A	XX	N/A
UI Designer & UX Strategist	$62.50	20	$1,250	$64.38	20	$1,287.60	$66.31	20	$1,326.20	N/A	XX	N/A	N/A	XX	N/A
										N/A	XX	N/A	N/A	XX	N/A
										N/A	XX	N/A	N/A	XX	N/A
										N/A	XX	N/A	N/A	XX	N/A
TOTAL DIRECT LABOR		400	$4,550.00		400	$4,686.80		400	$4,827.40		XX	N/A		XX	N/A
Labor Burden	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Rate	Hrs Burden Applied to	Total Amount	Base	Hrs Burden Applied to	Total Amount	Base	Hrs Burden Applied to	Total Amount
FRINGE BENEFITS	30%	$4,550.00	$1,365.00	30%	$4,686.80	$1,406.04	30%	$4,827.40	$1,448.22	N/A	N/A	N/A	N/A	N/A	N/A
OVERHEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL LABOR BURDEN			$1,365.00			$1,406.04			$1,448.22			N/A			N/A
TRAVEL MATERIALS/SUPPLIES			None			None						N/A			N/A
TRAVEL TRANSPORTATION			$2,000.00			$2,060.00			$2,121.80			N/A			N/A
TOTAL SUBCONTRACTOR COSTS			$7,915.00			$8,152.45			$8,396.98			N/A			N/A
TOTAL SPECIAL PAYMENTS			None			None						N/A			N/A
TOTAL DIRECT COSTS			$16,830.00			$17,335.49			$17,853.60			N/A			N/A
G&A Each COM	Rate	Base Applied to	Total Amount	Rate	Base Applied to	Total Amount	Rate	Base Applied to	Total Amount	Base	Base Applied to	Total Amount	Base	Base Applied to	Total Amount
G&A Each	15.00%	$16,830.00	$2,524.50	15.00%	$17,335.49	$2,600.32	15.00%	$17,853.60	$2,678.04	N/A	N/A	N/A	N/A	N/A	N/A
FACILITIES CAPITAL COST OF MONEY (COM) (Attach Computation, DFARS 215.4)			None			None			None			N/A			N/A
TOTAL COSTS			$19,354.50			$19,935.81			$20,531.58			N/A			N/A
FEE/PROFIT	Fee Rate	Fee Rate Applied to Total Cost Including COM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost Including COM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost Including COM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost Including COM	Total Amount	Fee Rate	Fee Rate Applied to Total Cost Including COM	Total Amount
FEE/PROFIT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL CONSIDERATION						None			None			N/A			N/A

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City (EcoHealth Alliance)		Contract Period	
Purpose:	Meet with rel New York based Data Science and Research Technology team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$400.00	$284.00	$534.00	$120.00	$1,338.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in New York City	$ 20.00
Total:	$ 20.00

Trip #:	2		Location:	Washington DC Area (DTRA and BSVE)		Contract Period	
Purpose:	Meet with DTRA and the BSVE team					Base Period	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
2	2	$400.00	$284.00	$534.00	$120.00	$1,338.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington DC Metro area	$ 20.00
Total:	$ 20.00

Trip #:			Location:			Contract Period	
Purpose:						(Select Period)	
Days	# of People	Airfare	Per Diem	Lodging	Other	Total	
						$0.00	

Itemized Expenses for "Other"

Description	Amount
Total:	$0.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information
Consultant - M. Pollack, Deputy Editor	$15,720.00	Base Period	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $78.85 per hour.
Consultant - Associate Editor	$43,635.30	Base Period	1970 hours of work by an ProMed Associate Editor, calculated at a rate of $22.15 per hour
Consultant - Copy Editor	$6,320.00	Base Period	160 hours of work by a ProMed Copy Editor, calculated at a rate of $28.81 per hour.
Consultant - M. Pollack, Deputy Editor	$16,243.10	Option I	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $81.22 per hour.
Consultant - Associate Editor	$44,944.52	Option I	1970 Hours of work by an ProMed Associate Editor, calculated at a rate of $22.81 per hour
Consultant - Copy Editor	$6,861.60	Option I	160 hours of work by a ProMed Copy Editor, calculated at a rate of $30.39 per hour.
Consultant - M. Pollack, Deputy Editor	16730.393	Option II	200 hours of work by a ProMed Deputy Editor, Marjorie Pollack, calculated at a rate of $83.65 per hour.
Consultant - Associate Editor	$46,292.90	Option II	1970 Hours of work by an ProMed Associate Editor, calculated at a rate of $23.50 per hour
Consultant - Copy Editor	5067.448	Option II	160 hours of work by a ProMed Copy Editor, calculated at a rate of $31.80 per hour.

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES, INC.

9 BABCOCK ST.,

BROOKLINE, MA 02446

FRINGE BENEFIT RATE CALCULATION

Social Security	- 6.20 % of salary
Medicare	- 1.45
Workers Comp Insurance	- 1.35
Health Insurance	- 11.00
Retirement	- 9.00
TOTAL	30.00 % of salary

Payroll Summary

Check Date	Name	Hours	Total Paid	Tax Withheld	Deductions	Net Pay	Check No	Employer Liability	Total Expense
Pay Frequency:	Monthly								
08/27/2014	[redacted]	[redacted]	[redacted]	[redacted]	0.00	[redacted]	DD	[redacted]	[redacted]
08/27/2014	[redacted]	[redacted]	[redacted]	[redacted]	0.00	[redacted]	DD	[redacted]	[redacted]
08/27/2014	[redacted]	[redacted]	[redacted]	[redacted]	0.00	[redacted]	[redacted]	[redacted]	[redacted]
08/27/2014	MADOFF, LAWRENCE	66.56	7,917.00	2,097.84	0.00	5,819.16	DD	605.55	8,522.55
08/27/2014	[redacted]	[redacted]	[redacted]	[redacted]	0.00	[redacted]	DD	[redacted]	[redacted]
08/27/2014	[redacted]	[redacted]	[redacted]	[redacted]	0.00	[redacted]	DD	[redacted]	[redacted]
08/27/2014	TENENHOLZ, DREW	66.56	4,774.00	1,606.44	0.00	3,167.56	75337406	365.21	5,139.21
Pay Frequency Totals: Monthly		[redacted]	[redacted]	[redacted]	$0.00	[redacted]		[redacted]	[redacted]
Total Net Pays for Monthly frequency: 7									
Company Totals:		[redacted]	[redacted]	[redacted]	$0.00	[redacted]		[redacted]	[redacted]
Total Net Pays for Company: 7									

COST SUMMARY

Cost Element	Base Period			Option I			Option II		
	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount	Rate Hrly	Quantity # Hrs	Total Amount
Labor Category & Title									
Dr. J. Barnes	$48.22	835.19	$40,272.86	$49.67	835.19	$41,481.05	51.156398	835.19	$42,725.48
Patrick Reynolds	44.81	835.19	$37,424.46	$46.15	835.19	$38,547.61	47.538929	835.19	$39,704.04
R&D Engineer	44.31	1182.22	$52,384.17	$45.64	1182.22	$53,955.69	47.008479	1182.22	$55,574.36
R&D Engineer	44.31	1182.22	$52,384.17	$45.64	1182.22	$53,955.69	47.008479	1182.22	$55,574.36
TOTAL DIRECT LABOR		4034.82	**$182,466.06**		4034.82	**$187,940.04**		4034.82	**$193,578.25**
LABOR BURDEN	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount	Rate	Lbr Burden Applied to	Total Amount
FRINGE BENEFITS	"%	$	$	"%	$	$	"%	$	$
OVERHEAD	"%	$	$	"%	$	$	"%	$	$
TOTAL LABOR BURDEN			**$182,466.06**			**$187,940.04**			**$193,578.25**
TOTAL MATL EQUIPMENT			$0.00			$0.00			$
TOTAL TRAVEL COSTS			$3,654.00			$3,763.62			$3,876.53
TOTAL ALL OTHER DIRECT COSTS			$0.00			$0.00			$
TOTAL SUBCONTRACTOR COSTS			$0.00			$0.00			$
TOTAL DIRECT COSTS			**$186,120.06**			**$191,703.66**			**$197,454.77**
G&A, F&A, FCCM	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount	Rate	Rate Applied to	Total Amount
Indirect Costs	82.80"%	$186,120.06	$154,107.41	82.80"%	$191,703.66	$158,730.63	82.80"%	197,454.77	$163,492.55
G&A	38.40"%	$340,227.47	$130,647.35	38.40"%	$350,434.30	134,566.77	38.40"%	360,947.33	$138,603.77
FACILITIES CAPITAL COST OF MONEY (FCCM) (Attach Completed DD Form 1861)			$			$			$
TOTAL COSTS			**$470,874.82**			**485,001.07**			**$499,551.10**
FEE/ PROFIT	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount:	Fee Rate	Fee Rate Applied to: (total cost, excluding travel &FCCM)	Total Amount:
FEE OR PROFIT	7.00"%	$467,220.82	$32,705.46	7.00 -	481,237.45	$33,686.62	11.07	495,671.57	54,697.22
TOTAL COST PLUS FEE			**$503,580.28**			**$518,687.69**			**$34,248.32**

MATERIALS/EQUIPMENT						
Year	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period
						Additional Information

Note:
Consumables may be listed as a lump sum if unit price is less than $2,500. For those items that are over $2,500, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total	
2	2		$260.00	$284.00	$534.00	$220.00	$1,238.00	

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	2		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other	Total	
2	2		$260.00	$284.00	$534.00	$220.00	$1,238.00	

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	3		Location:	Washington, DC Area (DTRA and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
2	2		$420.00	$284.00	$354.00	$120.00	$1,178.00	

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

COST SUMMARY

	Base Period			Option I								
Cost Element	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount	Rate Fily	Quantity – Hrs	Total Amount
Labor Category & Title							\	XX	\	\	XX	\
Dr. Barnes	$46.27	835.79	$21,777.86	$49.67	835.79	$41,481.05	\	XX	\	\	XX	\
Patrick Reynolds	44.51	835.79	$37,432.86	$46.45	835.79	$38,827.61	\	XX	\	\	XX	\
R&D Engineer	44.51	1,182.22	$52,632.17	$45.62	1,182.22	$53,955.69	$	XX	$	$	XX	$
R&D Engineer	44.51	1,182.22	$52,632.17	$45.62	1,182.22	$53,955.69	\	XX	\	\	XX	\
							\	XX	\	\	XX	\
TOTAL DIRECT LABOR		4034.82	$182,466.06		4034.82	$187,943.04		XX	\		XX	\
LABOR BURDEN	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount	Rate	Per Dollar Applied To	Total Amount
FRINGE BENEFITS	%	\	\	%	\	\	%	\	\	%	\	\
OVERHEAD	%	\	\	%	\	\	%	\	\	%	\	\
TOTAL LABOR BURDEN			$182,466.06			$187,943.04			\			\
TOTAL EQUIPMENT			$0.00			$0.00			$			$
TOTAL TRAVEL COSTS			$4,832.00			$4,976.96			\			\
TOTAL ALL OTHER DIRECT COSTS			$0.00			$0.00			\			\
TOTAL SUBCONTRACTOR COSTS			$0.00			$0.00			$			$
TOTAL DIRECT COSTS			$187,298.06			$192,919.00			\			\
G&A, F&A, FCCM	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount	Rate	Rate Applied To	Total Amount
Indirect Costs	82.80%	$187,298.06	$155,052.80	82.80%	$192,919.00	$159,735.25	%	\	\	%	\	\
G&A	34.00%	$342,350.86	$116,479.29	34.00%	$353,652.28	$120,241.85	%	\	\	%	\	\
FACILITIES CAPITAL COST OF MONEY (FCCOM) (Attach Completed DD Form 1861)			\			\			\			\
TOTAL COSTS			$473,830.15			$488,896.76			\			\
FEE/PROFIT	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount	Fee Rate	Fee Rate Applied To (total cost, excluding travel & FCCOM)	Total Amount
FEE OR PROFIT	7.00%	$464,032.15	$32,482.25	7.00%	$483,103.50	$33,817.25	%	\	\	%	\	\
TOTAL COST PLUS FEE			$506,680.72			$521,887.35			$			$

MATERIALS/EQUIPMENT							
Item	Manufacturer	Part Number	Unit Price	Quantity	Total Price	Contract Period	Additional Information

Note:
Consumables may be listed as a lump sum if no individual item is over $5,000. For those items that are over $5,000, list separately from the rest of consumable pricing.

TRAVEL

Trip #:	1		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$532.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	2		Location:	New York City			Contract Period	
Purpose:	Meet with full New York based Data Science and Research Technology team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		Total
2	2		$200.00	$284.00	$532.00	$220.00		$1,238.00

Itemized Expenses for "Other"

Description	Amount
Train fare	$100.00
Transportation in New York City	$120.00
Total:	$220.00

Trip #:	3		Location:	Washington, DC Area (DTRA and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
2	2		$420.00	$284.00	$354.00	$120.00		$1,178.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

Trip #:	4		Location:	Washington, DC Area (DTRA and BSVE)			Contract Period	
Purpose:	Meet with DTRA and the BSVE team						Base Period	
Days	# of People		Airfare	Per Diem	Lodging	Other		
$2.00	$2.00		$420.00	$284.00	$354.00	$120.00		$1,178.00

Itemized Expenses for "Other"

Description	Amount
Transportation to and from airport and in Washington, DC Metro area	$120.00
Total:	$120.00

OTHER DIRECT COSTS			
Description	Total Price	Contract Period	Additional Information

SUBCONTRACTORS			
Company Name	Total Price	Contract Period	Additional Information

EMPLOYEE NAME / ID SSN STATE/FRQ STS LOCATION	EARNINGS DESCR	PAY RATE	CURRENT HOURS	CURRENT AMOUNT	YTD HOURS	YTD AMOUNT	DEDUCTIONS DESCR	CURRENT AMOUNT	YTD AMOUNT	TAXES DESCR	CURRENT AMOUNT	YTD AMOUNT	NET PAY / CHECK NO
	MP MED FSA			-2083		-33328							
EMPLOYEE TOTAL			9865	267533 330409	143040	3904913 4842920		196482	2882490		71051	1022423	
REYNOLDS, CHARLES PATR	1 HOURLY		10075	463552	148700	6707893	C1 CHECKING 1	297764	5016898	FEDERAL	87352	1404731	000
49 XXX-XX-XXXX NC NC NC	B BONUS					200000	GT GTL (OUT)	120	1920	OASDI	29475	471498	DIRDEP
24 S2/M0 100	V VACATION		500	23005	19280	873993	R1 REIMBURSE		-260739	MEDICARE	6893	110269	
46.0100 Hourly	11 MED 125			-11280		-179014				NC STATE	24600	393300	
Last Check Date 08/18/2014	GT GTL (IN)			120		1920							
	K1 401K EE			-19462		-311276							
	K3 ROTH 401			-9731		-155639							
EMPLOYEE TOTAL			10575	446204 486677	167980	7137877 7783806		297884	4758079		148320	2379798	
BAUMES, JEFFREY T	1 HOURLY		10425	520732	135935	6688603	C1 CHECKING 1	445807	5697716	FEDERAL	47036	633148	000
35 XXX-XX-XXXX NY NY NY	V VACATION		100	4995	19585	956499	GT GTL (OUT)	207	3312	OASDI	31608	458334	DIRDEP
24 M9/M9 100	1P MEDICAL			-16124		-255930	R1 REIMBURSE	-49779	-52048	MEDICARE	7392	107190	
49.9500 Hourly	GT GTL (IN)			207		3312				NY STATE	27539	388609	
Last Check Date 08/18/2014	K3 ROTH 401					-156223							
EMPLOYEE TOTAL			10525	509810 525934	155520	7236261 7648414		396235	5648980		113575	1587281	

Defense Threat Reduction Agency
(b)(6)
8725 John J. Kingman Road, MSC 6201
Ft. Belvoir, VA 22060-6201

Dear (b)(6)

Per your request, in the letter dated October 21st 2014, we are providing you with the additional information that you have requested.

Summary of Changes

- Technical Proposal
  - Tasks 4, 6,7,8,16,19, 21 and 22 were removed.
  - We provided additional information on how the network graphs will work within GRITS including their sources of information (labeled as Task 10 in your response letter).
  - Task 21 was removed, so we did not provide an inventory of EcoHD holdings as requested..
  - A 24-month timeline was created.

- Cost Proposal: Cost proposals for EHA and all subcontractors were updated to reflect the removal of tasks and did not result in considerable cost savings.

- Statement of Work (SOW): The SOW was updated to reflect the removed tasks.

- The proposal validity was extended 150 days from the date of this letter.

EcoHealth Alliance is very excited to begin next work under this agreement and is excited for the positive impact that this project will have on global public health. We are looking forward to working with you.

Thank you,

Dr. Andrew G. Huff

Senior Research Scientist
EcoHealth Alliance
460 West 34th Street 17th Floor
New York, NY 10001

Statement of Work

1.0 - Objective:

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:

The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:

1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowdsource annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
5. Crowdsource improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Forecast disease emergence

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:

Task 1: Connect GRITS Girder database to the BSVE (Year 1)

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API

5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing

1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Build mechanisms to crowdsource annotations

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 8: Incorporate disease network graphs to assist diagnostics

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blindspots' in the information network

Task 9: Support diagnostic algorithm development with dashboard

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results

3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 10: Expand diagnostic capability to arbitrary data feeds

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 11: Connect GRITS to GRID

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 12: Update diagnostic model in near-real-time

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 13: Use text mining to extend network graphs/ontologies

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 14: Crowdsource improvements to the GRITS media diagnostic tool (Year 3)

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 15: Connect GRID collective intelligence editor to the BSVE

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 16: Connect GRITS diagnostic data filtering to the BSVE

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 17: Enrich diagnostic dashboard with dynamic visualizations

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 18: Generate disease summary reports from diagnostics

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 19: Forecast disease emergence

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports

- Monthly Status Reports (36)
- Monthly Cost Status Reports (36)
- Quarterly Status Reports (12)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics
    - (V.5.4) - Crowdsourcing module for gathering additional training data
    - (V.5.5) - Disease forecast reports
- Miscellaneous data submissions:
    1. Feedback on diagnostic dashboard
    2. Crowdsourced labels and annotations
    3. Copy of GRID data
- Documentation:
    1. Documentation on near-real-time architecture
    2. Documentation for GRITS APIs

Statement of Work

1.0 - Objective:
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:
The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:
1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowd source annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
5. Connect GRITS diagnostic data filtering to the BSVE
6. Forecast disease emergence

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:
Task 1: Connect GRITS Girder database to the BSVE (Base Period)
1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)
1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords

3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations (Base Period)

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics (Base Period)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard (Base Period)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to GRID (Option Year 1)

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 12: Connect GRID collective intelligence editor to the BSVE (Option Year 1)

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 13: Connect GRITS diagnostic data filtering to the BSVE (Option Year 1)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics (Option Year 1)

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence (Option Year 1)

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports

- Monthly Status Reports (24)
- Monthly Cost Status Reports (24)
- Quarterly Status Reports (8)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics
    - (V.5.4) - Crowdsourcing module for gathering additional training data
    - (V.5.5) - Disease forecast reports
- Miscellaneous data submissions:
    1. Feedback on diagnostic dashboard
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    3. Copy of GRID data

- Documentation:
    1. Documentation on near-real-time architecture
    2. Documentation for GRITS APIs

Statement of Work

1.0 - Objective:
EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

2.0 - Scope:
The **technology areas** to be investigated are mathematical disease models, disease detection, web data mining, scientific application development, digital surveillance, and information storage and retrieval.

The **primary objective** is to deliver an application that facilitates rapid, high probability diagnosis of outbreaks to pinpoint disease threats more rapidly than current public health systems and diagnostics.

Major milestones:

1. Build BSVE interface to GRITS with the SDK
2. Build mechanisms to crowdsource annotations
3. Expand diagnostic capability to arbitrary data feeds
4. Connect GRITS to GRID
5. Crowdsource improvements to the GRITS media diagnostic tool
6. Connect GRITS diagnostic data filtering to the BSVE
7. Enrich diagnostic dashboard with dynamic visualizations
8. Forecast disease emergence

3.0 - Background:

This is an extension of a previously funded DTRA initiative. Relevant documents can be found in the references section of the technical proposal.

4.0 - Tasks/Technical Requirements:
Task 1: Connect GRITS Girder database to the BSVE (Base Period)

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing (Base Period)

1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE (Base Period)

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Build mechanisms to crowdsource annotations (Option Year 1)

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 8: Incorporate disease network graphs to assist diagnostics (Option Year 1)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blindspots' in the information network

Task 9: Support diagnostic algorithm development with dashboard (Option Year 1)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 10: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed

2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 11: Connect GRITS to GRID (Option Year 1)

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 12: Update diagnostic model in near-real-time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 13: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 14:Crowdsource improvements to the GRITS media diagnostic tool(Option Year 2)

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 15: Connect GRID collective intelligence editor to the BSVE (Option Year 2)

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 16: Connect GRITS diagnostic data filtering to the BSVE (Option Year 2)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 17: Enrich diagnostic dashboard with dynamic visualizations (Option Year 2)

1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 18: Generate disease summary reports from diagnostics (Option Year 2)

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 19: Forecast disease emergence (Option Year 2)

1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

5.0 - CDRLs/Other Deliverables:

Reports
- Monthly Status Reports (36)
- Monthly Cost Status Reports (36)
- Quarterly Status Reports (12)
- Final Report (1)
- Software Release Versions (V)
    - (V.4.7) - Robust Girder database backend (GRITS.db) and API access
    - (V.4.8) - Prototype GRITS event recommendations and filtering
    - (V.5.0) - Connect GRITS APIs to BSVE app
    - (V.5.1) - Connect GRITS.net to BSVE
    - (V.5.2) - Connect GRID event recommendations to API
    - (V.5.3) - Enhanced text mining and diagnostics
    - (V.5.4) - Crowdsourcing module for gathering additional training data
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- Miscellaneous data submissions:
    1. Feedback on diagnostic dashboard
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    3. Copy of GRID data
- Documentation:
    1. Documentation on near-real-time architecture
    2. Documentation for GRITS APIs

Volume I: Technical Proposal

I. Abstract

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) to deliver disease diagnostics, decision support, and data processing to the BSVE. We aim to enhance our current GRITS platform, developed with DTRA support, by scaling this system to handle large data volumes enhancing diagnostic capabilities through network and cluster analysis. GRITS will also utilize the benefits and explore the integration of crowdsourcing, collective intelligence, and expert review. This tool will rely on automation to ingest media, extract key disease characteristics, and recommend resources, increasing the specificity of the data feed to an analyst's workflow. We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose and to connect with experts from ProMED, HealthMap and EcoHealth, thereby increasing our network of experts from digital surveillance and open source communities. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats, advancing our readiness to combat the broad class of chemical and biological threats posed by EIDs.

Keywords
disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, data science

II. Scope

A. Objective

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease events. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver disease diagnostics, decision support, and data processing to the BSVE. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance and open source communities.

B. Background

The discovery of HIV/AIDS in the 1980s marked the transition from declaring victory over infectious diseases, to global increases in disease emergence and re-emergence[1]. EcoHealth Alliance (EHA) is at the forefront of organizations working to 'get ahead of the epidemic curve' by identifying these threats before the next pandemic or extinction event. Our researchers pioneered the identification of the origins of pathogens, such as Nipah virus[2], SARS[3], and MERS[4]. We constantly seek innovative approaches to target our field surveillance efforts on emerging threats[5]. To this end, the global increase in the volume of data, from the growth of the web and instrumented systems, presents both a challenge to traditional surveillance approaches and a tremendous opportunity for novel discoveries.

Various biosurveillance technologies have been developed to monitor Internet data sources, for instance, syndromic surveillance initiatives target surrogate indicators of a disease outbreak[6]. As with other sectors, such as commerce, marketing, and finance, the challenge is to manage the expanding volume of data while identifying signals of interest[7]. In the case of EIDs, access to emergent media, including participatory, personal, and interactive media, characterized by

decentralized content generation (e.g., the blogosphere, internationalization, and social media), presents an opportunity to detect early instances of disease characteristics and anomalies of interest.

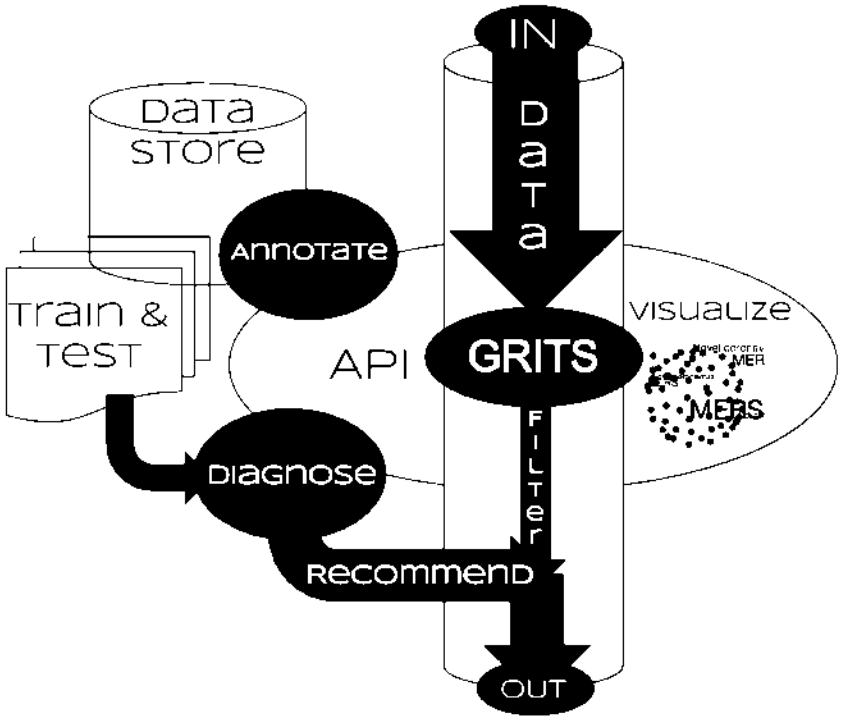
The GRITS partners are among the leading organizations in this domain. ProMED-mail (International Society of Infectious Diseases) manages a global email network of clinicians who are often among the first to identify and report disease threats[8]. Epidemico (HealthMap)[9] actively curates an expanding catalog of relevant news and social media assets. Both organizations are unique among their peers in leveraging broad networks of experts to curate and reduce the volume of media to a high-quality feed. Kitware Inc., our technical partner, has engineered sustainable communities around successful, high-impact open source scientific software.

EcoHealth assembled the GRITS team to advance the state-of-the-art in the detection and diagnosis of disease threats. GRITS combines new technologies with expert networks to apply the sciences of disease ecology and epidemiology to diagnosing big data for near-real-time disease situation awareness. We built GRITS upon pre-existing communities of expertise, rather than *de novo* technical solutions, recognizing that human experts must be integrated into the platform to ensure its intelligence and growth. In addition, we sought novel mechanisms for decision support by organizing, prioritizing, contextualizing, and linking information to relevant current and historic resources. Overall, we deploy science at the core of our systems to assemble near-real-time information in a manner that supports decision makers with diagnostic tools built by, and for, the digital disease ecology community. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats.

Description of GRITS Capabilities

We take a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS ingests and processes data feeds to provide decision support to analysts, with the following capabilities:

Diagnose - Identify the disease(s) described in a resource. Return a ranked list of diseases with quantitative metrics of certainty (differential diagnoses).
Mine - Extract the key components of document via automated analysis, collective annotation, and expert curation. Return a set of relevant information.
Recommend - Expand the materials available to the analyst. Return a collection of recommended resources that provide historic and contemporary context.
Filter - Reduce the complexity of the data feed by selecting those documents that meet diagnostic criteria of interest to the analyst. Return a filtered subset of data.
Connect - Relate the material to underlying ontologies to provide a decision framework for the analyst. Return connections to other bioevents based on underlying network structures (e.g., geography, ecology, time, host, pathogen, and environmental drivers).



Sources of GRITS Biointelligence

A. Machine Data mining, machine learning, and natural language processing

C. Collective Crowdsourcing annotation and human intelligence tasks

A. Machine

GRITS leverages automation to ingest, process, and return an initial diagnosis of digital media, reducing the extraneous sources of information through which experts and reviewers must sort. The GRITS text mining system extracts key disease characteristics, such as locations, case counts, and dates, for our metadata and diagnostic models. These features, which may be combined into composite features by high-level rules, are based on sentence patterns and keywords chosen from third-party sources such as WordNet, Geonames, Disease Ontology, Symptom Ontology, and Biocaster Ontology. The categories we extract, such as hosts, pathogens, diseases, signs and symptoms, drivers, and transmission types, are also informed by historic disease event data curated via our GRID project, and prioritized through consultation with our experts. The GRITS diagnostic models, that use machine-learning algorithms based on extracted keywords to classify articles, are trained on test articles labeled with diseases by our partners. A key function of this machine intelligence is to provide the materials and platforms to crowd source the training data.

C. Collective

The machine-learning component of GRITS requires training data from portfolios of articles with disease labels and disease characteristic metadata, information collected from HealthMap and ProMED editors to highlight and categorize important features and relationships. These are then used to train classifiers to identify specific features of importance. To extend the range of articles we can classify, we propose using crowdsourcing methods via Amazon's Mechanical Turk and Zooniverse to generate labels and annotations for articles that do not require domain expertise.

To further enhance the accuracy of the GRITS classification algorithms, we propose crowdsourcing a diagnostic challenge, whereby we host and share our training data on an existing challenge platform (e.g., Kaggle), where programmers compete to build classifiers to improve accuracy. These approaches would compliment the models developed by our internal users and promote global citizenship in combating the scourge of emerging infectious disease. Finally, we propose integrating EHA's Global Repository for Infectious Diseases (GRID) to solicit collective intelligence and peer editing to develop a canonical collection of event data portfolios for BSVE users and the broader scientific community. The BSVE will have access to the GRID API throughout the contract period with an option to continue access through continued funding. EHA will also provide a copy of the GRID data to DTRA at the end of the contract period.

Our two-pronged approach (machine and collective) is a unique strength of the GRITS platform. The automated tools enable experts to make the best use of their time by farming out less specialized tasks to the crowd, identifying errors in the data sources, and notifying editors or creating tasks to crowd source solutions. In the case that there isn't enough data to deliver an accurate diagnosis, GRITS will identify the most useful information in distinguishing disease candidates. Combined, this presents a unique conceptual model and workflow for supporting outbreak investigation.

Proposed Development

GRITS enhances traditional search with adaptive diagnostic models, trained on a broad spectrum of resources from GRITS partners and curated by our communities of experts. This diagnostic function reduces the complexity and increases the specificity of the data feed to an analyst's workflow. We propose scaling this system to handle large data volumes, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor data feeds for diseases or disease characteristics of interest. To ensure rapid diagnosis when a disease first emerges, GRITS blends social media, news media, and scientific literature. This approach may be further leveraged to identify unusual events and diagnostic gaps that may herald an emerging infectious disease of unknown etiology.

BSVE Integration and Benefits

We propose building an application with the BSVE SDK that allows BSVE users to submit resources to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards for decision support via additional visualizations and diagnostic tools. The data processing stack will provide the capabilities identified above (diagnose, mine, recommend, filter, and connect) to data being ingested or monitored by the BSVE. Our diagnostic service is designed to continually evolve and improve via mechanisms for input from collective and machine intelligence sources. Our novel approach to diagnostics builds upon traditional search with the infusion of disease ecology into the method.

Technical Challenges
Due to incomplete reporting, errant diagnoses, delayed onset of symptoms, and delays in laboratory results, it is difficult diagnose diseases in the early phase of an outbreak[10]. Dialect varies among data sources and there is high variability in accessibility of news sources and scientific literature. Software has a language bias where non-Latin characters are often the source of bugs, and foreign language articles require translation to fit into a single NLP pipeline. Additionally, media attention is biased toward OECD countries, with blind spots in some of the locations where diseases more frequently emerge, particularly those with limited clinical infrastructure and access to health professionals[11]. However, as a shared and accessible platform that can maximize the utility of both expert networks and machine intelligence, our tool is of particular value in resource-poor areas without laboratory diagnostic facilities or, with past events, where clinical samples are no longer available. To reduce the time lag in detecting EIDs, we are interested in identifying prompt data sources and recruiting members of the GRITS network and BSVE community in disease prone environments to provide additional reports of emerging diseases.

When attempting to respond to user submitted corrections and feedback, some classifiers take considerable time to train (e.g., neural nets), and completely retaining any classifier on big data can be prohibitive. We will need to investigate methods of incrementally retraining our classifier in a timely manner as new data is submitted.

Technical merit
Overall, we propose to expand our automated data extraction to support reporting initiatives and event notification systems with near-real-time automated extraction of disease-relevant information from an arbitrary, unstructured data feed. Further development of the GRITS text mining system will allow us to introduce ecological and epidemiological concepts to extract more complex information such as host-pathogen relationships and quantitative data (e.g., case counts) for modeling and analysis[12]. We want to improve the precision of the features we extract by developing more sophisticated natural language processing pipelines. Additionally, we plan to reduce error rates by taking advantage of the open source NLP software ecosystem to perform word sense disambiguation and coreference resolution. Identifying the features GRITS and BSVE users value and providing channels for them to provide us with feedback will also be important to improving GRITS. We propose dynamically retraining the classification algorithm GRITS uses to diagnose diseases based on user submitted corrections to its diagnosis. Finally, we plan on open sourcing reusable components of our system so that other groups can benefit from our work.

Our technology stack consists of modern web technologies like Meteor that allow us to seamlessly update the content of the UI. These frameworks are compatible with the current technologies in the BSVE, such as AngularJS. Furthermore, we employ implementations of machine learning algorithms from scikit-learn, and are using natural language processing algorithms (e.g., tokenizing, part-of-speech-tagging, lemmatization) from nltk, and CLIPS pattern. We have started with a Python ML/NLP stack because of the rich software ecosystem available, and the ability to prototype rapidly with IPython notebooks.

Scientific merit
Automated categorization of EID reports by the GRITS diagnostic classifier will enable analysts and to search and filter them, increasing the ratio of relevant information they review. Furthermore, GRITS will provide decision support by suggesting potential diseases in reports of

unknown diseases, and by recommending relevant data to review. Established networks of experts from EcoHealth and One Health will provide input on our diagnostic engine enabling us to continually improve upon it. Infectious disease emergence is a global-scale challenge requiring an extended, engaged community to monitor, track and respond to new threats; it is also intrinsically interdisciplinary given the complex life histories of many disease agents.

Ontologies are invaluable tools in artificial intelligence systems, decision support systems, data exploration and research where they can be used to make complex inferences and generate rich datasets. We seek to expand the scope of our ecological ontologies by considering taxonomic, distribution, ecological niche, and networks for pathogens and hosts. This will help us provide state of the art diagnostics for the BSVE by providing structured data from which we can make inferences with GRITS diagnostic algorithms. We plan to use the biointelligence extracted from news media and submitted by GRITS users to assemble a corpus of new information to form the basis of new relationships and entities within biological ontologies to help explain patterns of disease emergence. We are interested in incorporating these relationships and entities into public ontologies they derive from or relate to so that other projects benefit from our work. Our goal, with the work we propose, is to push our system to provide recommendations of to users for additional data-sources, work with citizen scientists to expand the data inputs to diagnostic tools, and integrate various GRITS components into the BSVE community.

C. Programmatics

This effort will support DoD CBDP, DTRA, and the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), HDTRA1-14-CHEM-BIO-BAA, Chemical Biological Technologies Department and is submitted in response to Topic: CBA-03: Next Generation Analytic Capabilities for BSV. The work will support DTRA's mission to safeguard America and its allies from biological WMDs by providing diagnostic capabilities to reduce, eliminate, and counter microbial threats. Specifically this "Global Rapid Identification Tool System" is aimed at developing capacity for the detection of EID threats, to support protection efforts and mitigation of the threats posed by disease agents through the New Initiatives in Science and Technology program. This technology is intended for eventual transition through the DTRA R&D Enterprise.

Management plan

Our management plan blends strong scientific expertise in global EID surveillance, with agile software engineering as well as iterative and incremental rapid application development. The project will be managed by our team of data scientists and software developers at EcoHealth Alliance, in consultation with thought leaders in the field of biosurveillance (Epidemico & ProMED-mail), and infused with innovative technologies Kitware Inc., developers of leading edge, high quality software.

Key personnel (roles/responsibilities)

- EcoHealth Alliance (prime): management, delivery, software integration, computing, diagnostic analysis, data science, data mining, disease ecology
    - Andrew Huff, Ph.D., M.S. (Principal Investigator - PI)
- Kitware Inc.: data management, visualization
    - Jeff Baumes, Ph.D. (Technical Sub-contractor)
- Epidemico: data curation, digital surveillance
    - John Brownstein, Ph.D. (Scientific Consultant)

- ProMED-mail: data curation, disease outbreak reporting
    - Larry Madoff, Ph.D. (Scientific Consultant)

Current data providers and collaborating centers:

- **ProMED-mail** - the Program for Monitoring Emerging Diseases - is an open source Internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants. Electronic communications enable ProMED-mail to provide up-to-date and reliable news seven days a week. Sources of information include media reports, official reports, online summaries, local observers, and others. A team of expert moderators screen, review, and investigate reports before posting to the network and distributing by email. ProMED-mail currently reaches over 40,000 subscribers in at least 185 countries.
- **HealthMap** - The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health.
- **Global Repository of Infectious Disease (GRID) project** - an EHA project describing the initial emergence of global infectious disease bioevents since 1940. We collected direct language from the primary literature describing the agent, time, place, impact, transmission, host, driver, EID category, and economics of the event to discover patterns and trends among these variables across time and space. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities.
- **GIDEON** - Global Infectious Disease and Epidemiology Network - is the world's premier global infectious diseases knowledge management database. It contains a diagnostic module that employs information on symptoms, country, incubation period, and laboratory tests to construct a ranked differential diagnosis. The Infectious Diseases module encompasses over 340 infectious diseases, 231 countries, over 500 anti-infective drugs and vaccines.
- **PubMed, Google Scholar, and Web of Science** - will be used to generate records of confirmed diagnoses and historical outbreaks. Additionally, we hope to explore archival resources such as CDC disease reports.

D. Relevance

Our goal with this project is to develop a tool system of high-relevance to DTRA's Goals and Objectives. With the support of DTRA, we could advance our GRITS to full development and extend timely operational capability to all sectors affected by the threat of EIDs. This state-of-the-art technology will help advance our readiness to combat the broad class of biological threats posed by EIDs, including the capability to identify agents with the potential to be used as WMDs. We have the expertise and capacity to ensure useable capability of the GRITS application within the timeline of tasks we propose. The tools will provide near-real-time decision support to end-users of GRITS and the BSVE. By using open source and transparent methods, we ensure that our results are reproducible and that the technology is portable, reliable, agile, and flexible in confronting emerging threats. The tools we propose are state-of-the-art, both scientifically and technically. GRITS leverage the latest reactive web technologies (e.g., Meteor), visualization environments (e.g., WebGL and Tangelo), and scientific databases (e.g.,

Girder). The machine learning and clustering algorithms are drawn from Scikit-learn, an open and accessible, community-supported Python library.

A key strategy in mitigating EID risk is to build situational awareness as far forward from our shores as possible, by using advanced digital biosurveillance to detect early signals that portend the emergence of high-risk, priority diseases and pathogens, including bioterrorism agents. This biosurveillance technology is adaptable to low resource settings, among them those most vulnerable to EIDs. Ultimately we hope to empower our warfighters and allies with the tools necessary to adapt and shape the dynamic Global Security Environment, as it pertains to the acute threat of infectious diseases.

Responses to DTRA's questions from the White Paper
How will the proposed system be sustained? Is a fee for service model envisioned? If so, details should be provided.
We propose providing to DTRA all of the data hosted in GRITS.db and all of the code developed for this proposed system under permissive open source licenses (e.g., MIT and Apache2). Furthermore, EHA has established the Data Science and Research Technology (DART) lab with the express goal of supporting the services outlined in this proposal. We envision sustaining the service under a 'fee for service' model to be negotiated with DTRA upon delivery of the work. We would do so in coordination from our technical subcontractor, Kitware Inc., who has extensive experience supporting open source development for federal agencies, including DoD. Our data subcontractors have agreed to make the full data available to DTRA spanning the duration of the contract (beginning Jan 18, 2013). Where copyright restrictions limit our ability to distribute the full text of the media, we will provide programmatic tools to retrieve the text in compliance with the terms and conditions of the source. Additionally, we propose a 'freemium' mechanism to sustain data hosting and processing costs, whereby DTRA-approved users or organizations could access the service on a pay-as-you-go basis (e.g., paying for characters processed or volume stored).

What will actually be delivered to the Government/BSVE? Will this simply be an API to the EHA system, or will underlying tools and data be delivered? If yes, please clearly describe all deliverables.
We are prepared to deliver all materials developed through the contract under permissive open source licenses. Given the complexity of the system, and the maintenance burden, we recommend that that EHA continue to maintain the materials on a mutually agreed upon third party service (e.g., AWS) and provide the access to the data and diagnostic capabilities through our API. The source code will be made available through a private repository. We will provide full documentation, as we have done for the data service we are currently providing to the BSVE developed by Digital Infuzion. This applies to all deliverables, including GRITS.app, GRITS.db, and GRITS.md. The GRID platform has been developed with support from other agencies, foundations, and universities; however, we will provide unlimited access in perpetuity to DTRA via the API and web interface. The source code for Tangelo visualizations Girder are publicly available on Github and permissively licensed.

III. Credentials

A. Summary of Credentials

EcoHealth Alliance (EHA):

Building on over 40 years of groundbreaking science, EHA is a global nonprofit organization dedicated to protecting wildlife and safeguarding human health from the emergence of disease. The organization develops ways to combat the effects of damaged ecosystems on human and wildlife health. Using environmental and health data covering the past 60 years, EHA's scientists created the first ever global disease hotspots map that identified at-risk regions, to help predict and prevent the next pandemic crisis. That work is the foundation of EHA's rigorous, science-based approach, focused at the intersection of the environment, health and capacity building. Working in the U.S. and more than 20 countries worldwide, EHA's strength is founded on innovations in research, training, global partnerships, and policy initiatives.

EHA is a partner of the USAID Emerging Pandemic Threats PREDICT program, a $75 million effort focused on predicting and preventing pandemic diseases. PREDICT is building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people (zoonotic diseases). PREDICT has developed a SMART surveillance method (Strategic, Measurable, Adaptive, Responsive, and Targeted) that accounts for the fact that zoonotic pathogens, like influenza and SARS, are responsible for the majority of emerging infectious diseases in people, and that more than three quarters of these emerging zoonoses are of wildlife origin. The SMART surveillance approach is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. It also targets sentinel animal species at active human interfaces in hotspot regions to improve surveillance efficiency.

The PREDICT team builds on a broad coalition of partners to develop the global capacity to monitor diseases at the animal-human interface and develop a risk-based approach to concentrate these efforts in surveillance, prevention, and response at the most critical points for disease emergence from wildlife.

PREDICT project objectives:

- Assess local surveillance capacity;
- Implement targeted and adaptive wildlife disease surveillance systems;
- Develop and deliver new technologies to improve efforts close to the source;
- Use cutting-edge information management and communication tools to bring the world closer to realizing an integrated, global approach to emerging zoonotic diseases.

Partners:
HealthMap/Epidemico
HealthMap is a team of researchers, epidemiologists and software developers based out of the Children's Hospital, Boston. Founded in 2006, HealthMap is an established global leader in utilizing online informal sources for disease outbreak monitoring and real-time surveillance of emerging public health threats. The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases for a diverse audience including libraries, local health departments, governments, and international travelers. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to

achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health. Through an automated process, updating 24/7/365, the system monitors, organizes, integrates, filters, visualizes and disseminates online information about emerging diseases in nine languages, facilitating early detection of global public health threats.

ProMED
ProMED-mail was established in 1994 with the support of the Federation of American Scientists and SatelLife. Since October 1999, ProMED-mail has operated as an official program of the International Society for Infectious Diseases, a nonprofit professional organization with 20,000 members worldwide.

Kitware, Inc.
Kitware, Inc. creates and supports leading edge, high quality software in the fields of computer vision, medical imaging, visualization, 3D data publishing, and technical software development. Kitware employs an open source development model to foster extended, collaborative communities, and an open source business model to provide flexible, low-cost technical solutions. The Company's services and products include technology integration, software support, consulting, custom application development, and training and productivity tools that leverage our open-source software systems.

B. Summary of Qualifications for PI and Key Personnel
Dr. Andrew Huff (PI), is a senior research scientist at EcoHealth Alliance. Over the past 4 years, he patented a novel technology at the University of Minnesota, to collect and combine disparate spatial data sources to rapidly identify biologically or chemically contaminated sources of food. To accomplish this difficult task, he has engineered spatial algorithms and has created novel primary functional keys for data fusion. While at Sandia National Laboratories, he developed multiple computational models for infectious disease consequence prediction and developed unique analytical methods for infectious disease epidemiology and emergence. He has worked on projects funded by DOE, DHS, DoS, DTRA, DVA FDA, HHS, and USDA.

Dr. John Brownstein is an Associate Professor at Harvard Medical School and directs the Computational Epidemiology Group at Children's Hospital Informatics Program in Boston. His group is supported by a multi-million dollar budget with support from NIH (NLM and NIAID), USAID, Centers for Disease Control and Prevention, and Google.org. He has pioneered efforts in participatory epidemiology, using statistical and informatics approaches aimed at improving public health surveillance and practice. He recently was awarded the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government to outstanding scientists and engineers.

Dr. Lawrence Madoff is an infectious disease physician whose career has been devoted to disease surveillance. Dr. Madoff is the Editor of ProMED-mail, which uses Internet-based communication and social media to detect and report emerging infectious diseases globally. He is currently Director of the Division of Epidemiology and Immunization at the Massachusetts Department of Public Health, which oversees infectious disease surveillance and immunization activities in the state. He is a fellow of the American College of Physicians and a Fellow of the Infectious Disease Society of America.

Dr. Jeff Baumes is a technical lead at Kitware Inc. He has significant expertise in information analysis and presentation. His contributions include novel graph clustering algorithms that allow cluster overlap, and algorithms for discovering subsets of individuals persistently connected over time. Over the last six years, he has been a major technical contributor to the open source Titan scalable analysis and visualization toolkit, which is an extension of the Visualization Toolkit to include informatics and information visualization capabilities. He has worked on projects in several fields surrounding Titan such as text analysis, bioinformatics, and social network analysis including funding from NSF, DoD, DOE, and NIH.

C. Summary of Facilities to Perform the Proposed Work

Facilities at EcoHealth Alliance (EHA)
EcoHealth Alliance (EHA) is a 501(c)(3) nonprofit organization that specializes in scientific research on the causes, origins, and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory. A core administrative staff of 11 employees support EHA's scientific team (15 core scientists, 100+ field staff) and are available for work on this project through foundation support. EHA is equipped with 25 networked PCs including ARRA funded International Live Meeting Video Conferencing facilities. EHA has access to multiple servers, server support, and all necessary software on Mac, Linux, and Windows operating systems. Additional computing power is acquired from commercial cloud providers to meet project needs.

EHA has an active program of staff development and this is reviewed and adjusted annually as part of each employee's evaluation process. Specific provisions are made for internal training and external training resources, tuition support programs via a partnership with Columbia University, and active support of staff to spend time in collaborators organizations. All early stage investigators are mentored to provide guidance in research practices, grant management, administration and project management. Financial support from EHA core funds is available to support external tuition, travel to conferences and to conduct joint research in collaborator's institutions. There is no obligation for teaching time at EHA and all research staff are funded for 100% research time; however, there is a provision, through partnership with Columbia University, to enable staff to teach at the undergraduate and graduate level, with monetary support provided by Columbia University. Administration and other staff are supported in their efforts to enhance their careers by the provision of tuition fees for external courses, travel funds for conferences, and time off their core activities.

Facilities at Kitware Inc.
Kitware Inc. is headquartered just north of Albany, New York in a Clifton Park office complex. Kitware rents approximately 27,000 square feet of office space at this location. Kitware also has an office in Chapel Hill, North Carolina approximately 6,200 square feet in size. Both offices are linked via a common virtual private network and a shared phone system, and share financial and administrative personnel. They also have on-site office managers, lunchrooms, private meeting rooms, and advanced conference facilities including large screen projection systems and whole-room Polycom video conferencing systems. The proposed work will be performed at the Clifton Park site.

Kitware has a mixed environment of personal and shared computing platforms. Employees average three computers per person (desktop, laptop, and/or home system), with each computer typically equipped with multiple multi-core processors, a high-performance graphics card, dual monitors, and 8GB or more of main memory. These personal systems run a mix of Windows, Mac OS X, and Linux operating systems. Shared resources include compilation and testing farms as well as workstations running a variety of alternative operating systems for testing purposes, e.g., Windows XP or Vista. Kitware also maintains several servers to provide public access to the open source VTK, ITK, TubeTK, Titan, Slicer, CMake, and ParaView systems; to host web pages and web services for open source communities such as NA-MIC and Visomics; to operate open-access journals such as the Insight Journal and the Midas journal which has hosted workshop papers for nearly ten years; and to provide access to massive collections of public data for computer vision and medical imaging algorithm evaluation. Access to these systems is provided by a fiber connection to the Internet yielding a total of 100 Mbit/second data rate.

Kitware hosts several special-purpose, high-end workstations, GPU systems, haptic systems, and magnetic and optical trackers. One such workstation is a multi-GPU computer featuring 6 NVidia GPU boards: 5 C2050 Tesla and 1 Quadro 5000 Fermi, as well as a 6-Core X5680 3.33GHz processor. A noteworthy haptic system is a MBP Freedom 7S haptic device, configurable for 6 or 7 degrees of freedom. To address large-scale distributed computing, the company maintains several clusters for development and testing. The clusters include: a twelve node testing cluster running mixed Linux and Windows operating systems; a four node Windows cluster with a gigabit Ethernet network; and a seven node Linux cluster with dual 64-bit Xenon processors, high-end graphics accelerators, and an Infiniband network driving a 3x2 PowerWall display. Kitware also has access to several external computer systems (e.g., HP, IBM, and Intel) through various vendor partnership programs.

IV. WORK TO BE PERFORMED.

A. General

Our goal over the 3-year time period is to expand our DTRA-funded GRITS platform to deliver disease diagnostics, decision support, and data processing. These enhanced capabilities will be powered by GRITS analytics, and data.

We are currently building a robust and scalable software infrastructure to provide a diagnostic decision support system for analysts. The final deliverable will include our user interface (GRITS.app), application interface (GRITS.api), media diagnostics (GRITS.md), and database (GRITS.db). Overall, GRITS will be deployable and generalized application that will output probabilities and lists of pathogens likely responsible for an outbreak on the basis of user-provided data. Accordingly, the resource will be adaptable to a specific organization or agency's needs or emerging threats, and geographic areas of high concern. The source code for this algorithm will be made available to interested parties for further development and adaptation.

The original Rapid Identification Tool (RIT) prototype was developed by manually extracting symptoms from encephalitides reports in ProMED-mail to train a diagnostic model. Through rigorous testing, we identified modeling approaches that improved performance by combining natural language processing and machine learning algorithms. We recognized automated data collection and crowd sourced data curation would be needed to scale to disease coverage and

diagnose additional diseases with greater precision. The GRITS diagnostic dashboard provides decision support to experts at our partner organizations by automatically extracting and visualizing information from media. We leverage crowdsourcing techniques by providing experts with tools for curating disease portfolios and annotating articles. We have developed an application programming interface (API) for access to our data and diagnostics by third party developers and users. Additionally, we integrated the project with an ongoing EHA initiative to collect historical disease outbreak data (Global Repository for Infectious Diseases - GRID). Finally, we integrated work from our colleagues at Kitware to support the storage and visualization of the large, complex datasets being generated.

During the proposed contract period, we will improve the accuracy and robustness of the GRITS media diagnostics. We will experiment with crowdsourcing as an additional source of training data and knowledge to further improve GRITS.md and expand the capabilities of the system to provide decision support and recommendations to analysts.

By the end of the contract period GRITS will provide:

1. Robust architecture for diagnostics and data processing;
2. Interface from BSVE to GRITS with SDK;
3. Healthmap, ProMED-mail, and EcoHealth data to the BSVE; and,
4. Machine and community intelligence.

Diagnostic modeling
We plan to use the biointelligence extracted from news media and submitted by GRITS users to form the basis of new relationships and entities within biological ontologies that link EID events, diseases, symptoms, hosts, and other entities and attributes related to infectious diseases together in a rich network structure. This ontology will be a critical data source for making domain specific inferences in diagnostic algorithms.

Data Storage and Management
Girder is a data management platform built to meet the needs of distributed, data-centric web applications. Girder is a modular framework that allows developers to build systems that use any or all of the components necessary to create a system tailored to their needs. All data sharing web applications need the same core functionality: upload, download, large data storage, supplemental metadata storage and indexing, authentication/authorization, a RESTful API, and extensible plugin architecture. Girder provides these components and is currently being used for GRITS as well as several DOE projects.

B. Summary

Base Year (2015)

1. Connect GRITS Girder database to the BSVE
2. Develop recommendation and decision support capabilities
3. Connect GRITS diagnostic and text-mining APIs to the BSVE
4. Build BSVE interface to GRITS with the SDK
5. Build mechanisms to crowd source annotations
6. Incorporate disease network graphs to assist diagnostics
7. Support diagnostic algorithm development with dashboard

Option Year 1 (2016)

8. Expand diagnostic capability to arbitrary data feeds
9. Connect GRITS to GRID
10. Update diagnostic model in near-real-time
11. Use text mining to extend network graphs/ontologies.
12. Connect GRID's collective intelligence editor to the BSVE
13. Connect GRITS diagnostic data filtering to the BSVE
14. Generate disease summary reports from diagnostics
15. Forecast disease emergence

C. Detailed Tasks

Task 1: Connect GRITS Girder database to the BSVE
Description: Coordinate with BSVE developers to provide API access to GRITS database (HealthMap, ProMED and EcoHealth data with diagnostic metadata).
Resources: EcoHealth & Kitware (API, BSVE support), HealthMap & ProMED (data).
Metric(s) of success: BSVE access to GRITS data via API.
Deliverable: API key and access for the BSVE team, communication between BSVE/GRITS.
Subtasks:

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities
Description: Use our GRITS.md to extract features of incoming articles to inform media recommendations for analysts based on areas or keywords of interest or a collection of documents being evaluated. Identify targets for data collection that would most enhance diagnostic capabilities for a particular event.
Resources: EcoHealth (algorithms and infrastructure), Kitware (storage & visualization), HealthMap & ProMED (testing).
Metrics of success: Recommendation system returns relevant articles, people and organizations. Adding recommended information improves diagnosis.
Deliverable: API and diagnostic dashboard interface to recommendations.
Subtasks:

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE
Description: Provide BSVE developers with API access to GRITS media diagnostics and text mining tools and support them as they integrate these features into the BSVE interface.
Resources: EcoHealth (API development, BSVE support).

Metrics of success: BSVE team satisfied with API structure. GRITS features and diagnoses accessible through BSVE.
Deliverable: API access for the BSVE team, communication between BSVE/GRITS.
Subtasks:

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK
Description: Build an app on the BSVE SDK that allows BSVE users to submit text to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards where users can see additional visualizations and interact further with GRITS diagnostic tools.
Resources: EcoHealth (app development & testing).
Metrics of success: Users able to access GRITS through app deployed to BSVE.
Deliverable: Deployed app, BSVE users able to access diagnostic dashboards.
Subtasks:

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations
Description: Identify human intelligence annotation tasks for crowdsourcing by citizen scientists and Amazon's Mechanical Turk. Extend the annotation interface so that users can correct auto-generated annotations.
Resources: EcoHealth (annotation interface), Mechanical Turk (pay for annotations), Citizen Scientists (volunteers).
Metrics of success: Annotations crowd sourced. Improves diagnostics from annotations.
Deliverable: Crowd sourced annotations incorporated into GRITS training data.
Subtasks:

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics
Description: Model the geographic, ecological, and information structures of infectious disease networks and connect them to diagnostic API. Develop visualizations for diagnostic dashboard.
Resources: EcoHealth & Kitware (network modeling, visualization). Data sources: OpenStreetMaps, Customs and Border Patrol commercial trade data, Ecologicaldata.org, Geonames.org, Bpedia.org, Public Health Agency Canada, CDC's Morbidity and Mortality

Weekly Report (MMWR), EHA's GRID/SICKI, PubMED, OBO ontologies, Crisis.net, and Moz.com. Open source Python code for spatial network analysis (e.g., Sage, lumify.io, OWL).
Metrics of success: Improved diagnostics from network reasoning.
Deliverable: Visualizations of the network model in the diagnostic dashboard.
Subtasks:

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard
Description: Support multiple models for diagnosis, and continually reevaluate their effectiveness. Different algorithms may perform differently with time, origin, or diseases. Allow users to run and compare the results of different models via the diagnostic dashboard. Run automated jobs to compare the performance of models over time.
Resources: EcoHealth & Kitware (algorithm and interface development).
Metrics of success: Run and compare models from the dashboard.
Deliverable: Capacity to compare model performance in the dashboard.
Subtasks:

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds
Description: Develop robust scraping algorithms and provide an interface for users to connect data sources to GRITS.
Resources: EcoHealth (algorithms), Language translation service.
Metrics of success: Users can submit relevant feeds to the GRITS system.
Deliverable: Interface for submitting data feeds.
Subtasks:

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to GRID
Description: Incorporate GRID dataset into GRITS to give the platform a comprehensive historical perspective on EIDs and enhance analytic capabilities around drivers of disease behavior. Extend the recommendation system to include historic context from GRID (e.g., media and data). Use historic event data to expand to match targets for a disease or keyword.
Resources: EcoHealth (recommendation system, GRID).
Metrics of success: Diagnostic decision support enriched by historic event data.
Deliverable: Improved recommendation system, match new reports with historic events.
Subtasks:

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g., current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality

5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time
Description: Retrain the classifier with new reports from HealthMap/ProMED or users submissions. Classify labeled training data with GRITS, for example correcting misclassification. Investigate classifiers capable of distributed training or incremental retraining.
Resources: EcoHealth (algorithm and architecture development).
Metrics of success: Model updates improve performance. Classifier updates.
Deliverable: Enhanced classification infrastructure, retraining interface.
Subtasks:
1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies
Description: Use features extracted from disease reports to add entities and relationships to disease network ontology. For example, linking case counts to locations.
Resources: EcoHealth (feature extraction and ontologies).
Metrics of success: Accuracy of entities and relationships extracted from our data sources.
Deliverable: An extended ontology generated by text-mining algorithms.
Subtasks:
1. Infer set of subjects (e.g., EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g., viral strains that have mutated or developed antibiotic resistance).

Task 12: Connect GRID collective intelligence editor to the BSVE
Description: Incorporate BSVE users as experts for the review and editing GRID events.
Resources: EcoHealth (GRID).
Metrics of success: BSVE users contribute to GRID. Diagnostic models improve from GRID data. Additional features are extracted based on GRID data.
Deliverable: BSVE/GRITS access to GRID, improved diagnostics and feature extraction.
Subtasks:
1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 13: Connect GRITS diagnostic data filtering to the BSVE
Description: Use diagnostics to reduce data volume to relevant reports. Users should be able to list diseases or regions of interest.
Resources: EcoHealth & Kitware (GRITS integration and data filtering).
Metrics of success: GRITS will return a subset of related assets.
Subtasks:

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics
Description: Aggregate the data collected by text-mining and diagnostic algorithms to give an meta overview of a collection of reports or disease outbreak.
Resources: EcoHealth (algorithms and reporting).
Metrics of success: Number of visits per unique user to the summary report website
Deliverable: API returns summary reports to diagnostic dashboard and BSVE.
Subtasks:
1. Create algorithms for generating statistics (e.g., case counts) and visualizations (e.g., epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence
Description: EHA are experts in disease hotspot mapping. Use GRITS.db and GRITS.md to identify diseases that pose the greatest threat. Use case-counts and data from historical epidemic curves to model probable epidemic curves for new diseases.
Resources: EcoHealth (hotspots modeling).
Metrics of success: The cumulative difference between the actual epidemic curve and predicted curve. Identify hotspots for disease emergence based on diagnostics.
Deliverable: Return geocoded hotspots via API for visualization on BSVE.
Subtasks:
1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Maintenance Plan
- Support the Global Rapid Identification Tool System (GRITS) on the cloud
- Develop a software process infrastructure for the GRITS developer community
- Build a robust server network to ensure uptime of the GRITS platform
- Develop a test suite to identify issues and ensure compatibility with the BSVE
- Develop user and developer documentation for the platform
- Maintain the software via a ticketing system.

V. Performance of Work

Description of Services: We shall provide all management, tools, supplies, equipment, and labor necessary to build GRITS. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be

powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance and open source communities.

Period of Performance: Performance period for this contract will be no more than 150 days from the date of award, and will run continuously for 12 months with the provision for one time extension of this contract for an additional 12-month period.

Task 1: Connect GRITS Girder database to the BSVE (Base Period)

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations (Base Period)

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics (Base Period)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard (Base Period)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to GRID (Option Year 1)

1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 12: Connect GRID collective intelligence editor to the BSVE (Option Year 1)

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 13: Connect GRITS diagnostic data filtering to the BSVE (Option Year 1)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics (Option Year 1)

1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence (Option Year 1)

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Records: EHA shall be responsible for creating, maintaining, and disposing of only those government required records that are specifically cited in this PWS or required by the provisions of a mandatory directive listed in If requested by the Government, EHA shall provide the original record or a reproducible copy of any such record within 14 working days of receipt of the request.

Year 1			
Q1	Q2	Q3	Q4

Connect GRITS Girder database to the BSVE

Develop recommendation and decision support capabilities

Connect GRITS diagnostic and text-mining APIs to the BSVE

Prototype near-real-time processing

Build BSVE interface to GRITS with the SDK

Connect GRITS expert network (GRITS.net) to the BSVE

Test diagnostic dashboard with expert communities.

Year 2			
Q1	Q2	Q3	Q4

Enhance the expert annotation interface

Build mechanisms to crowdsource annotations

Incorporate disease network graphs to assist diagnostics

Support diagnostic algorithm development with dashboard

Expand diagnostic capability to arbitrary data feeds

Connect GRITS to GRID

Update diagnostic model in near-real-time

Use text mining to extend network graphs/ontologies.

Year 3			
Q1	Q2	Q3	Q4

Crowdsource improvements to the GRITS media diagnostic tool

Connect GRID's collective intelligence editor to the BSVE

Connect GRITS diagnostic data filtering to the BSVE

Enrich diagnostic dashboard with dynamic visualizations

Generate disease summary reports from diagnostics

Connect EcoHD to GRITS recommendations

Create a web-crawler for expanding coverage of disease reports

Forecast disease emergence

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Volume I: Technical Proposal

I. Abstract

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) to deliver disease diagnostics, decision support, and data processing to the BSVE. We aim to enhance our current GRITS platform, developed with DTRA support, by scaling this system to handle large data volumes enhancing diagnostic capabilities through network and cluster analysis. GRITS will also utilize the benefits and explore the integration of crowdsourcing, collective intelligence, and expert review. This tool will rely on automation to ingest media, extract key disease characteristics, and recommend resources, increasing the specificity of the data feed to an analyst's workflow. We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose and to connect with experts from ProMED and EcoHealth, thereby increasing our network of experts from digital surveillance and open source communities. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats, advancing our readiness to combat the broad class of chemical and biological threats posed by EIDs.

Keywords
disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, data science, disease emergence

II. Scope

A. Objective

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease events. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver disease diagnostics, decision support, and data processing to the BSVE. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance, open source, and infectious disease ecology communities.

B. Background

The discovery of HIV/AIDS in the 1980s marked the transition from declaring victory over infectious diseases, to global increases in disease emergence and re-emergence[1]. EcoHealth Alliance (EHA) is at the forefront of organizations working to 'get ahead of the epidemic curve' by identifying these threats before the next pandemic or extinction event. Our researchers pioneered the identification of the origins of pathogens, such as Nipah virus[2], SARS[3], and MERS[4]. We constantly seek innovative approaches to target our field surveillance efforts on emerging threats[5]. To this end, the global increase in the volume of data, from the growth of the web and instrumented systems, presents both a challenge to traditional surveillance approaches and a tremendous opportunity for novel discoveries.

Various biosurveillance technologies have been developed to monitor Internet data sources, for instance, syndromic surveillance initiatives target surrogate indicators of a disease outbreak[6]. As with other sectors, such as commerce, marketing, and finance, the challenge is to manage the expanding volume of data while identifying signals of interest[7]. In the case of EIDs, access to emergent media, including participatory, personal, and interactive media, characterized by decentralized content generation (e.g., the blogosphere, internationalization, and social media),

presents an opportunity to detect early instances of disease characteristics and anomalies of interest.

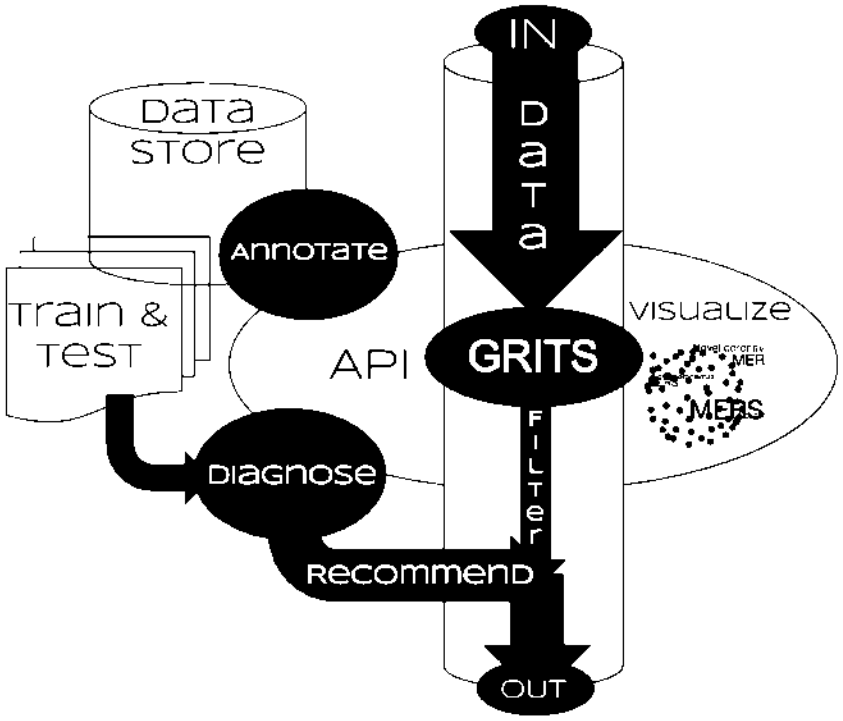
The GRITS collaborators are among the leading organizations in this domain. ProMED-mail (International Society of Infectious Diseases) manages a global email network of clinicians who are often among the first to identify and report disease threats[8]. EHA and its international partners actively conduct biosurveillance on emerging infectious diseases globally[9]. Both organizations are unique among their peers in leveraging broad networks of experts to curate and reduce the volume of media to a high-quality feed. Kitware Inc., our technical partner, has engineered sustainable communities around successful, high-impact open source scientific software.

EcoHealth assembled the GRITS team to advance the state-of-the-art in the detection and diagnosis of disease threats. GRITS combines new technologies with expert networks to apply the sciences of disease ecology and epidemiology to diagnosing big data for near-real-time disease situation awareness. We built GRITS upon pre-existing communities of expertise, rather than *de novo* technical solutions, recognizing that human experts must be integrated into the platform to ensure its intelligence and growth. In addition, we sought novel mechanisms for decision support by organizing, prioritizing, contextualizing, and linking information to relevant current and historic resources. Overall, we deploy science at the core of our systems to assemble near-real-time information in a manner that supports decision makers with diagnostic tools built by, and for, the digital disease ecology community. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats.

Description of GRITS Capabilities

We take a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS ingests and processes data feeds to provide decision support to analysts, with the following capabilities:

Diagnose - Identify the disease(s) described in a resource. Return a ranked list of diseases with quantitative metrics of certainty (differential diagnoses).
Mine - Extract the key components of document via automated analysis, collective annotation, and expert curation. Return a set of relevant information.
Recommend - Expand the materials available to the analyst. Return a collection of recommended resources that provide historic and contemporary context.
Filter - Reduce the complexity of the data feed by selecting those documents that meet diagnostic criteria of interest to the analyst. Return a filtered subset of data.
Connect - Relate the material to underlying ontologies to provide a decision framework for the analyst. Return connections to other bioevents based on underlying network structures (e.g., geography, ecology, time, host, pathogen, and environmental drivers).



Sources of GRITS Biointelligence

A. Machine Data mining, machine learning, and natural language processing

C. Collective Crowdsourcing annotation and human intelligence tasks

A. Machine

GRITS leverages automation to ingest, process, and return an initial diagnosis of digital media, reducing the extraneous sources of information through which experts and reviewers must sort. The GRITS text mining system extracts key disease characteristics, such as locations, case counts, and dates, for our metadata and diagnostic models. These features, which may be combined into composite features by high-level rules, are based on sentence patterns and keywords chosen from third-party sources such as WordNet, Geonames, Disease Ontology, Symptom Ontology, and Biocaster Ontology. The categories we extract, such as hosts, pathogens, diseases, signs and symptoms, drivers, and transmission types, are also informed by historic disease event data curated via our EIDR project, and prioritized through consultation with our experts. The GRITS diagnostic models, that use machine-learning algorithms based on extracted keywords to classify articles, are trained on test articles labeled with diseases by our partners. A key function of this machine intelligence is to provide the materials and platforms to crowd source the training data.

C. Collective
The machine-learning component of GRITS requires training data from portfolios of articles with disease labels and disease characteristic metadata, information collected from open source health informatics websites (e.g., ProMED) to highlight and categorize important features and relationships. These are then used to train classifiers to identify specific features of importance. To extend the range of articles we can classify, we propose using crowdsourcing methods via Amazon's Mechanical Turk and Zooniverse to generate labels and annotations for articles that do not require domain expertise.

To further enhance the accuracy of the GRITS classification algorithms, we propose crowdsourcing a diagnostic challenge, whereby we host and share our training data on an existing challenge platform (e.g., Kaggle), where programmers compete to build classifiers to improve accuracy. These approaches would compliment the models developed by our internal users and promote global citizenship in combating the scourge of emerging infectious disease. Finally, we propose integrating EHA's Global Repository for Infectious Diseases (EIDR) to solicit collective intelligence and peer editing to develop a canonical collection of event data portfolios for BSVE users and the broader scientific community. The BSVE will have access to the EIDR API throughout the contract period with an option to continue access through continued funding. EHA will also provide a copy of the EIDR data to DTRA at the end of the contract period.

Our two-pronged approach (machine and collective) is a unique strength of the GRITS platform. The automated tools enable experts to make the best use of their time by farming out less specialized tasks to the crowd, identifying errors in the data sources, and notifying editors or creating tasks to crowd source solutions. In the case that there isn't enough data to deliver an accurate diagnosis, GRITS will identify the most useful information in distinguishing disease candidates. Combined, this presents a unique conceptual model and workflow for supporting outbreak investigation.

Proposed Development
GRITS enhances traditional search with adaptive diagnostic models, trained on a broad spectrum of resources from GRITS partners and curated by our communities of experts. This diagnostic function reduces the complexity and increases the specificity of the data feed to an analyst's workflow. We propose scaling this system to handle large data volumes, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor data feeds for diseases or disease characteristics of interest. To ensure rapid diagnosis when a disease first emerges, GRITS blends social media, news media, and scientific literature. This approach may be further leveraged to identify unusual events and diagnostic gaps that may herald an emerging infectious disease of unknown etiology.

BSVE Integration and Benefits
We propose building an application with the BSVE SDK that allows BSVE users to submit resources to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards for decision support via additional visualizations and diagnostic tools. The data processing stack will provide the capabilities identified above (diagnose, mine, recommend, filter, and connect) to data being ingested or monitored by the BSVE. Our diagnostic service is designed to continually evolve and improve via mechanisms for input from collective and machine intelligence sources. Our novel approach to diagnostics builds upon traditional search with the infusion of disease ecology into the method.

Technical Challenges
Due to incomplete reporting, errant diagnoses, delayed onset of symptoms, and delays in laboratory results, it is difficult diagnose diseases in the early phase of an outbreak[10]. Dialect varies among data sources and there is high variability in accessibility of news sources and scientific literature. Software has a language bias where non-Latin characters are often the source of bugs, and foreign language articles require translation to fit into a single NLP pipeline. Additionally, media attention is biased toward OECD countries, with blind spots in some of the locations where diseases more frequently emerge, particularly those with limited clinical infrastructure and access to health professionals[11]. However, as a shared and accessible platform that can maximize the utility of both expert networks and machine intelligence, our tool is of particular value in resource-poor areas without laboratory diagnostic facilities or, with past events, where clinical samples are no longer available. To reduce the time lag in detecting EIDs, we are interested in identifying prompt data sources and recruiting members of the GRITS network and BSVE community in disease prone environments to provide additional reports of emerging diseases.

When attempting to respond to user submitted corrections and feedback, some classifiers take considerable time to train (e.g., neural nets), and completely retaining any classifier on big data can be prohibitive. We will need to investigate methods of incrementally retraining our classifier in a timely manner as new data is submitted.

Technical merit
Overall, we propose to expand our automated data extraction to support reporting initiatives and event notification systems with near-real-time automated extraction of disease-relevant information from an arbitrary, unstructured data feed. Further development of the GRITS text mining system will allow us to introduce ecological and epidemiological concepts to extract more complex information such as host-pathogen relationships and quantitative data (e.g., case counts) for modeling and analysis[12]. We want to improve the precision of the features we extract by developing more sophisticated natural language processing pipelines. Additionally, we plan to reduce error rates by taking advantage of the open source NLP software ecosystem to perform word sense disambiguation and coreference resolution. Identifying the features GRITS and BSVE users value and providing channels for them to provide us with feedback will also be important to improving GRITS. We propose dynamically retraining the classification algorithm GRITS uses to diagnose diseases based on user submitted corrections to its diagnosis. Finally, we plan on open sourcing reusable components of our system so that other groups can benefit from our work.

Our technology stack consists of modern web technologies like Meteor that allow us to seamlessly update the content of the UI. These frameworks are compatible with the current technologies in the BSVE, such as AngularJS. Furthermore, we employ implementations of machine learning algorithms from scikit-learn, and are using natural language processing algorithms (e.g., tokenizing, part-of-speech-tagging, lemmatization) from nltk, and CLIPS pattern. We have started with a Python ML/NLP stack because of the rich software ecosystem available, and the ability to prototype rapidly with IPython notebooks.

Scientific merit
Automated categorization of EID reports by the GRITS diagnostic classifier will enable analysts and to search and filter them, increasing the ratio of relevant information they review. Furthermore, GRITS will provide decision support by suggesting potential diseases in reports of

unknown diseases, and by recommending relevant data to review. Established networks of experts from EcoHealth and One Health will provide input on our diagnostic engine enabling us to continually improve upon it. Infectious disease emergence is a global-scale challenge requiring an extended, engaged community to monitor, track and respond to new threats; it is also intrinsically interdisciplinary given the complex life histories of many disease agents.

Ontologies are invaluable tools in artificial intelligence systems, decision support systems, data exploration and research where they can be used to make complex inferences and generate rich datasets. We seek to expand the scope of our ecological ontologies by considering taxonomic, distribution, ecological niche, and networks for pathogens and hosts. This will help us provide state of the art diagnostics for the BSVE by providing structured data from which we can make inferences with GRITS diagnostic algorithms. We plan to use the biointelligence extracted from news media and submitted by GRITS users to assemble a corpus of new information to form the basis of new relationships and entities within biological ontologies to help explain patterns of disease emergence. We are interested in incorporating these relationships and entities into public ontologies they derive from or relate to so that other projects benefit from our work. Our goal, with the work we propose, is to push our system to provide recommendations of to users for additional data-sources, work with citizen scientists to expand the data inputs to diagnostic tools, and integrate various GRITS components into the BSVE community.

C. Programmatics

This effort will support DoD CBDP, DTRA, and the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), HDTRA1-14-CHEM-BIO-BAA, Chemical Biological Technologies Department and is submitted in response to Topic: CBA-03: Next Generation Analytic Capabilities for BSV. The work will support DTRA's mission to safeguard America and its allies from biological WMDs by providing diagnostic capabilities to reduce, eliminate, and counter microbial threats. Specifically this "Global Rapid Identification Tool System" is aimed at developing capacity for the detection of EID threats, to support protection efforts and mitigation of the threats posed by disease agents through the New Initiatives in Science and Technology program. This technology is intended for eventual transition through the DTRA R&D Enterprise.

Management plan

Our management plan blends strong scientific expertise in global EID surveillance, with agile software engineering as well as iterative and incremental rapid application development. The project will be managed by our team of data scientists and software developers at EcoHealth Alliance, in consultation with thought leaders in the field of biosurveillance (ISID), and infused with innovative technologies Kitware Inc., developers of leading edge, high quality software.

Key personnel (roles/responsibilities)

- EcoHealth Alliance (prime): management, delivery, software integration, computing, diagnostic analysis, data science, data mining, disease ecology
    - Andrew Huff, Ph.D., M.S. (Principal Investigator - PI)
- Kitware Inc.: data management, visualization
    - Jeff Baumes, Ph.D. (Technical Sub-contractor)
- ProMED-mail: data curation, disease outbreak reporting
    - Larry Madoff, Ph.D. (Scientific Consultant)

Sources of open source data:

- **ProMED-mail** - the Program for Monitoring Emerging Diseases - is an open source Internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants. Electronic communications enable ProMED-mail to provide up-to-date and reliable news seven days a week. Sources of information include media reports, official reports, online summaries, local observers, and others. A team of expert moderators screen, review, and investigate reports before posting to the network and distributing by email. ProMED-mail currently reaches over 40,000 subscribers in at least 185 countries.
- **Mantle & EIDR** – are emerging infectious disease tools and databases created by EHA. EIDR describes the initial emergence of global infectious disease bioevents since 1940. We collected direct language from the primary literature describing the agent, time, place, impact, transmission, host, driver, EID category, and economics of the event to discover patterns and trends among these variables across time and space. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities. We are going to use the information collected, stored, and shared with Mantle to help GRITS more accurately detect disease emergence events, to increase diagnostic accuracy of diseases, and to improve the predictive capabilities of GRITS.
- **GIDEON** - Global Infectious Disease and Epidemiology Network - is the world's premier global infectious diseases knowledge management database. It contains a diagnostic module that employs information on symptoms, country, incubation period, and laboratory tests to construct a ranked differential diagnosis. The Infectious Diseases module encompasses over 340 infectious diseases, 231 countries, over 500 anti-infective drugs and vaccines.
- **PubMed, Google Scholar, and Web of Science** - will be used to generate records of confirmed diagnoses and historical outbreaks. Additionally, we hope to explore archival resources such as CDC disease reports.

D. Relevance

Our goal with this project is to develop a tool system of high-relevance to DTRA's Goals and Objectives. With the support of DTRA, we could advance our GRITS to full development and extend timely operational capability to all sectors affected by the threat of EIDs. This state-of-the-art technology will help advance our readiness to combat the broad class of biological threats posed by EIDs, including the capability to identify agents with the potential to be used as WMDs. We have the expertise and capacity to ensure useable capability of the GRITS application within the timeline of tasks we propose. The tools will provide near-real-time decision support to end-users of GRITS and the BSVE. By using open source and transparent methods, we ensure that our results are reproducible and that the technology is portable, reliable, agile, and flexible in confronting emerging threats. The tools we propose are state-of-the-art, both scientifically and technically. GRITS leverage the latest reactive web technologies (e.g., Meteor), visualization environments (e.g., WebGL and Tangelo), and scientific databases (e.g., Girder). The machine learning and clustering algorithms are drawn from Scikit-learn, an open and accessible, community-supported Python library.

A key strategy in mitigating EID risk is to build situational awareness as far forward from our shores as possible, by using advanced digital biosurveillance to detect early signals that portend the emergence of high-risk, priority diseases and pathogens, including bioterrorism agents. This

biosurveillance technology is adaptable to low resource settings, among them those most vulnerable to EIDs. Ultimately we hope to empower our warfighters and allies with the tools necessary to adapt and shape the dynamic Global Security Environment, as it pertains to the acute threat of infectious diseases.

Responses to DTRA's questions from the White Paper
How will the proposed system be sustained? Is a fee for service model envisioned? If so, details should be provided.
We propose providing to DTRA all of the data hosted in GRITS.db and all of the code developed for this proposed system under permissive open source licenses (e.g., MIT and Apache2). Furthermore, EHA has established the Data Science and Research Technology (DART) lab with the express goal of supporting the services outlined in this proposal. We envision sustaining the service under a 'fee for service' model to be negotiated with DTRA upon delivery of the work. We would do so in coordination from our technical subcontractor, Kitware Inc., who has extensive experience supporting open source development for federal agencies, including DoD. Our data subcontractors have agreed to make the full data available to DTRA spanning the duration of the contract (beginning Jan 18, 2013). Where copyright restrictions limit our ability to distribute the full text of the media, we will provide programmatic tools to retrieve the text in compliance with the terms and conditions of the source. Additionally, we propose a 'freemium' mechanism to sustain data hosting and processing costs, whereby DTRA-approved users or organizations could access the service on a pay-as-you-go basis (e.g., paying for characters processed or volume stored).

What will actually be delivered to the Government/BSVE? Will this simply be an API to the EHA system, or will underlying tools and data be delivered? If yes, please clearly describe all deliverables.
We are prepared to deliver all materials developed through the contract under permissive open source licenses. Given the complexity of the system, and the maintenance burden, we recommend that that EHA continue to maintain the materials on a mutually agreed upon third party service (e.g., AWS) and provide the access to the data and diagnostic capabilities through our API. The source code will be made available through a private repository. We will provide full documentation, as we have done for the data service we are currently providing to the BSVE developed by Digital Infuzion. This applies to all deliverables, including GRITS.app, GRITS.db, and GRITS.md. The EIDR platform has been developed with support from other agencies, foundations, and universities; however, we will provide unlimited access in perpetuity to DTRA via the API and web interface. The source code for Tangelo visualizations Girder are publicly available on Github and permissively licensed.

III. Credentials

A. Summary of Credentials

EcoHealth Alliance (EHA):

Building on over 40 years of groundbreaking science, EHA is a global nonprofit organization dedicated to protecting wildlife and safeguarding human health from the emergence of disease. The organization develops ways to combat the effects of damaged ecosystems on human and wildlife health. Using environmental and health data covering the past 60 years, EHA's scientists created the first ever global disease hotspots map that identified at-risk regions, to help predict and prevent the next pandemic crisis. That work is the foundation of EHA's rigorous, science-based approach, focused at the intersection of the environment, health and capacity building. Working in the U.S. and more than 20 countries worldwide, EHA's strength is founded on innovations in research, training, global partnerships, and policy initiatives.

EHA is a partner of the USAID Emerging Pandemic Threats PREDICT program, a $75 million effort focused on predicting and preventing pandemic diseases. PREDICT is building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people (zoonotic diseases). PREDICT has developed a SMART surveillance method (Strategic, Measurable, Adaptive, Responsive, and Targeted) that accounts for the fact that zoonotic pathogens, like influenza and SARS, are responsible for the majority of emerging infectious diseases in people, and that more than three quarters of these emerging zoonoses are of wildlife origin. The SMART surveillance approach is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. It also targets sentinel animal species at active human interfaces in hotspot regions to improve surveillance efficiency.

The PREDICT team builds on a broad coalition of partners to develop the global capacity to monitor diseases at the animal-human interface and develop a risk-based approach to concentrate these efforts in surveillance, prevention, and response at the most critical points for disease emergence from wildlife.

PREDICT project objectives:

- Assess local surveillance capacity;
- Implement targeted and adaptive wildlife disease surveillance systems;
- Develop and deliver new technologies to improve efforts close to the source;
- Use cutting-edge information management and communication tools to bring the world closer to realizing an integrated, global approach to emerging zoonotic diseases.

Partners:
ProMED
ProMED-mail was established in 1994 with the support of the Federation of American Scientists and SatelLife. Since October 1999, ProMED-mail has operated as an official program of the International Society for Infectious Diseases, a nonprofit professional organization with 20,000 members worldwide.

Kitware, Inc.
Kitware, Inc. creates and supports leading edge, high quality software in the fields of computer vision, medical imaging, visualization, 3D data publishing, and technical software development.

Kitware employs an open source development model to foster extended, collaborative communities, and an open source business model to provide flexible, low-cost technical solutions. The Company's services and products include technology integration, software support, consulting, custom application development, and training and productivity tools that leverage our open-source software systems.

B. Summary of Qualifications for PI and Key Personnel

Dr. Andrew Huff (PI), is a senior research scientist at EcoHealth Alliance. Over the past 4 years, he patented a novel technology at the University of Minnesota, to collect and combine disparate spatial data sources to rapidly identify biologically or chemically contaminated sources of food. To accomplish this difficult task, he has engineered spatial algorithms and has created novel primary functional keys for data fusion. While at Sandia National Laboratories, he developed multiple computational models for infectious disease consequence prediction and developed unique analytical methods for infectious disease epidemiology and emergence. He has worked on projects funded by DOE, DHS, DoS, DTRA, DVA FDA, HHS, and USDA.

Dr. Lawrence Madoff is an infectious disease physician whose career has been devoted to disease surveillance. Dr. Madoff is the Editor of ProMED-mail, which uses Internet-based communication and social media to detect and report emerging infectious diseases globally. He is currently Director of the Division of Epidemiology and Immunization at the Massachusetts Department of Public Health, which oversees infectious disease surveillance and immunization activities in the state. He is a fellow of the American College of Physicians and a Fellow of the Infectious Disease Society of America.

Dr. Jeff Baumes is a technical lead at Kitware Inc. He has significant expertise in information analysis and presentation. His contributions include novel graph clustering algorithms that allow cluster overlap, and algorithms for discovering subsets of individuals persistently connected over time. Over the last six years, he has been a major technical contributor to the open source Titan scalable analysis and visualization toolkit, which is an extension of the Visualization Toolkit to include informatics and information visualization capabilities. He has worked on projects in several fields surrounding Titan such as text analysis, bioinformatics, and social network analysis including funding from NSF, DoD, DOE, and NIH.

C. Summary of Facilities to Perform the Proposed Work

Facilities at EcoHealth Alliance (EHA)

EcoHealth Alliance (EHA) is a 501(c)(3) nonprofit organization that specializes in scientific research on the causes, origins, and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory. A core administrative staff of 11 employees support EHA's scientific team (15 core scientists, 100+ field staff) and are available for work on this project through foundation support. EHA is equipped with 25 networked PCs including ARRA funded International Live Meeting Video Conferencing facilities. EHA has access to multiple servers, server support, and all necessary software on Mac, Linux, and Windows operating systems. Additional computing power is acquired from commercial cloud providers to meet project needs.

EHA has an active program of staff development and this is reviewed and adjusted annually as part of each employee's evaluation process. Specific provisions are made for internal training and external training resources, tuition support programs via a partnership with Columbia University, and active support of staff to spend time in collaborators organizations. All early stage investigators are mentored to provide guidance in research practices, grant management, administration and project management. Financial support from EHA core funds is available to support external tuition, travel to conferences and to conduct joint research in collaborator's institutions. There is no obligation for teaching time at EHA and all research staff are funded for 100% research time; however, there is a provision, through partnership with Columbia University, to enable staff to teach at the undergraduate and graduate level, with monetary support provided by Columbia University. Administration and other staff are supported in their efforts to enhance their careers by the provision of tuition fees for external courses, travel funds for conferences, and time off their core activities.

Facilities at Kitware Inc.
Kitware Inc. is headquartered just north of Albany, New York in a Clifton Park office complex. Kitware rents approximately 27,000 square feet of office space at this location. Kitware also has an office in Chapel Hill, North Carolina approximately 6,200 square feet in size. Both offices are linked via a common virtual private network and a shared phone system, and share financial and administrative personnel. They also have on-site office managers, lunchrooms, private meeting rooms, and advanced conference facilities including large screen projection systems and whole-room Polycom video conferencing systems. The proposed work will be performed at the Clifton Park site.

Kitware has a mixed environment of personal and shared computing platforms. Employees average three computers per person (desktop, laptop, and/or home system), with each computer typically equipped with multiple multi-core processors, a high-performance graphics card, dual monitors, and 8GB or more of main memory. These personal systems run a mix of Windows, Mac OS X, and Linux operating systems. Shared resources include compilation and testing farms as well as workstations running a variety of alternative operating systems for testing purposes, e.g., Windows XP or Vista. Kitware also maintains several servers to provide public access to the open source VTK, ITK, TubeTK, Titan, Slicer, CMake, and ParaView systems; to host web pages and web services for open source communities such as NA-MIC and Visomics; to operate open-access journals such as the Insight Journal and the Midas journal which has hosted workshop papers for nearly ten years; and to provide access to massive collections of public data for computer vision and medical imaging algorithm evaluation. Access to these systems is provided by a fiber connection to the Internet yielding a total of 100 Mbit/second data rate.

Kitware hosts several special-purpose, high-end workstations, GPU systems, haptic systems, and magnetic and optical trackers. One such workstation is a multi-GPU computer featuring 6 NVidia GPU boards: 5 C2050 Tesla and 1 Quadro 5000 Fermi, as well as a 6-Core X5680 3.33GHz processor. A noteworthy haptic system is a MBP Freedom 7S haptic device, configurable for 6 or 7 degrees of freedom. To address large-scale distributed computing, the company maintains several clusters for development and testing. The clusters include: a twelve node testing cluster running mixed Linux and Windows operating systems; a four node Windows cluster with a gigabit Ethernet network; and a seven node Linux cluster with dual 64-bit Xenon processors, high-end graphics accelerators, and an Infiniband network driving a 3x2 PowerWall

display. Kitware also has access to several external computer systems (e.g., HP, IBM, and Intel) through various vendor partnership programs.

IV. WORK TO BE PERFORMED.

A. General

Our goal over the 3-year time period is to expand our DTRA-funded GRITS platform to deliver disease diagnostics, decision support, and data processing. These enhanced capabilities will be powered by GRITS analytics, and data.

We are currently building a robust and scalable software infrastructure to provide a diagnostic decision support system for analysts. The final deliverable will include our user interface (GRITS.app), application interface (GRITS.api), media diagnostics (GRITS.md), and database (GRITS.db). Overall, GRITS will be deployable and generalized application that will output probabilities and lists of pathogens likely responsible for an outbreak on the basis of user-provided data. Accordingly, the resource will be adaptable to a specific organization or agency's needs or emerging threats, and geographic areas of high concern. The source code for this algorithm will be made available to interested parties for further development and adaptation.

The original Rapid Identification Tool (RIT) prototype was developed by manually extracting symptoms from encephalitides reports in ProMED-mail to train a diagnostic model. Through rigorous testing, we identified modeling approaches that improved performance by combining natural language processing and machine learning algorithms. We recognized automated data collection and crowd sourced data curation would be needed to scale to disease coverage and diagnose additional diseases with greater precision. The GRITS diagnostic dashboard provides decision support to experts at our partner organizations by automatically extracting and visualizing information from media. We leverage crowdsourcing techniques by providing experts with tools for curating disease portfolios and annotating articles. We have developed an application programming interface (API) for access to our data and diagnostics by third party developers and users. Additionally, we integrated the project with an ongoing EHA initiative to collect historical disease outbreak data (Global Repository for Infectious Diseases - EIDR). Finally, we integrated work from our colleagues at Kitware to support the storage and visualization of the large, complex datasets being generated.

During the proposed contract period, we will improve the accuracy and robustness of the GRITS media diagnostics. We will experiment with crowdsourcing as an additional source of training data and knowledge to further improve GRITS.md and expand the capabilities of the system to provide decision support and recommendations to analysts.

By the end of the contract period GRITS will provide:

1. Robust architecture for diagnostics and data processing;
2. Interface from BSVE to GRITS with SDK;
3. Analysis and synthesis of multiple open source data *to* the BSVE; and,
4. Machine and community intelligence.

Diagnostic modeling
We plan to use the biointelligence extracted from news media and submitted by GRITS users to form the basis of new relationships and entities within biological ontologies that link EID events, diseases, symptoms, hosts, and other entities and attributes related to infectious diseases together in a rich network structure. This ontology will be a critical data source for making domain specific inferences in diagnostic algorithms.

Data Storage and Management
Girder is a data management platform built to meet the needs of distributed, data-centric web applications. Girder is a modular framework that allows developers to build systems that use any or all of the components necessary to create a system tailored to their needs. All data sharing web applications need the same core functionality: upload, download, large data storage, supplemental metadata storage and indexing, authentication/authorization, a RESTful API, and extensible plugin architecture. Girder provides these components and is currently being used for GRITS as well as several DOE projects.

B. Summary

Base Year (2015)

1. Connect GRITS Girder database to the BSVE
2. Develop recommendation and decision support capabilities
3. Connect GRITS diagnostic and text-mining APIs to the BSVE
4. Build BSVE interface to GRITS with the SDK
5. Build mechanisms to crowd source annotations
6. Incorporate disease network graphs to assist diagnostics
7. Support diagnostic algorithm development with dashboard

Option Year 1 (2016)

8. Expand diagnostic capability to arbitrary data feeds
9. Connect GRITS to EIDR
10. Update diagnostic model in near-real-time
11. Use text mining to extend network graphs/ontologies.
12. Connect EIDR's collective intelligence editor to the BSVE
13. Connect GRITS diagnostic data filtering to the BSVE
14. Generate disease summary reports from diagnostics
15. Forecast disease emergence

C. Detailed Tasks

Task 1: Connect GRITS Girder database to the BSVE
Description: Coordinate with BSVE developers to provide API access to GRITS database (ProMED and EcoHealth data with diagnostic metadata).
Resources: EcoHealth & Kitware (API, BSVE support), EHA & ProMED (data).
Metric(s) of success: BSVE access to GRITS data via API.
Deliverable: API key and access for the BSVE team, communication between BSVE/GRITS.
Subtasks:

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS

3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities
Description: Use our GRITS.md to extract features of incoming articles to inform media recommendations for analysts based on areas or keywords of interest or a collection of documents being evaluated. Identify targets for data collection that would most enhance diagnostic capabilities for a particular event.
Resources: EcoHealth (algorithms and infrastructure), Kitware (storage & visualization), EHA & ProMED (testing).
Metrics of success: Recommendation system returns relevant articles, people and organizations. Adding recommended information improves diagnosis.
Deliverable: API and diagnostic dashboard interface to recommendations.
Subtasks:

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE
Description: Provide BSVE developers with API access to GRITS media diagnostics and text mining tools and support them as they integrate these features into the BSVE interface.
Resources: EcoHealth (API development, BSVE support).
Metrics of success: BSVE team satisfied with API structure. GRITS features and diagnoses accessible through BSVE.
Deliverable: API access for the BSVE team, communication between BSVE/GRITS.
Subtasks:

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK
Description: Build an app on the BSVE SDK that allows BSVE users to submit text to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards where users can see additional visualizations and interact further with GRITS diagnostic tools.
Resources: EcoHealth (app development & testing).
Metrics of success: Users able to access GRITS through app deployed to BSVE.
Deliverable: Deployed app, BSVE users able to access diagnostic dashboards.
Subtasks:

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission

5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations
Description: Identify human intelligence annotation tasks for crowdsourcing by citizen scientists and Amazon's Mechanical Turk. Extend the annotation interface so that users can correct auto-generated annotations.
Resources: EcoHealth (annotation interface), Mechanical Turk (pay for annotations), Citizen Scientists (volunteers).
Metrics of success: Annotations crowd sourced. Improves diagnostics from annotations.
Deliverable: Crowd sourced annotations incorporated into GRITS training data.
Subtasks:

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics
Description: Model the geographic, ecological, and information structures of infectious disease networks and connect them to diagnostic API. Develop visualizations for diagnostic dashboard.
Resources: EcoHealth & Kitware (network modeling, visualization). Data sources: OpenStreetMaps, Customs and Border Patrol commercial trade data, Ecologicaldata.org, Geonames.org, Bpedia.org, Public Health Agency Canada, CDC's Morbidity and Mortality Weekly Report (MMWR), EHA's EIDR and Mantle, PubMED, OBO ontologies, Crisis.net, and Moz.com. Open source Python code for spatial network analysis (e.g., Sage, lumify.io, OWL).
Metrics of success: Improved diagnostics from network reasoning.
Deliverable: Visualizations of the network model in the diagnostic dashboard.
Subtasks:

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard
Description: Support multiple models for diagnosis, and continually reevaluate their effectiveness. Different algorithms may perform differently with time, origin, or diseases. Allow users to run and compare the results of different models via the diagnostic dashboard. Run automated jobs to compare the performance of models over time.
Resources: EcoHealth & Kitware (algorithm and interface development).
Metrics of success: Run and compare models from the dashboard.
Deliverable: Capacity to compare model performance in the dashboard.
Subtasks:

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters

4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds
Description: Develop robust scraping algorithms and provide an interface for users to connect data sources to GRITS.
Resources: EcoHealth (algorithms), Language translation service.
Metrics of success: Users can submit relevant feeds to the GRITS system.
Deliverable: Interface for submitting data feeds.
Subtasks:
1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to EIDR
Description: Incorporate EIDR dataset into GRITS to give the platform a comprehensive historical perspective on EIDs and enhance analytic capabilities around drivers of disease behavior. Extend the recommendation system to include historic context from EIDR (e.g., media and data). Use historic event data to expand to match targets for a disease or keyword.
Resources: EcoHealth (recommendation system, EIDR).
Metrics of success: Diagnostic decision support enriched by historic event data.
Deliverable: Improved recommendation system, match new reports with historic events.
Subtasks:
1. Evaluate existing EIDR API against needs of recommendation system
2. Develop capacity of EIDR API to deliver historic event matches
3. Recommend EIDR events (e.g., current event is similar to past outbreak)
4. Use EIDR media to improve diagnostics and recommendation quality
5. Match GRITS data to events in EIDR (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time
Description: Retrain the classifier with new reports from EHA/ProMED or users submissions. Classify labeled training data with GRITS, for example correcting misclassification. Investigate classifiers capable of distributed training or incremental retraining.
Resources: EcoHealth (algorithm and architecture development).
Metrics of success: Model updates improve performance. Classifier updates.
Deliverable: Enhanced classification infrastructure, retraining interface.
Subtasks:
1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies
Description: Use features extracted from disease reports to add entities and relationships to disease network ontology. For example, linking case counts to locations.
Resources: EcoHealth (feature extraction and ontologies).
Metrics of success: Accuracy of entities and relationships extracted from our data sources.
Deliverable: An extended ontology generated by text-mining algorithms.
Subtasks:

1. Infer set of subjects (e.g., EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g., viral strains that have mutated or developed antibiotic resistance).

Task 12: Connect EIDR collective intelligence editor to the BSVE
Description: Incorporate BSVE users as experts for the review and editing EIDR events.
Resources: EcoHealth (EIDR).
Metrics of success: BSVE users contribute to EIDR. Diagnostic models improve from EIDR data. Additional features are extracted based on EIDR data.
Deliverable: BSVE/GRITS access to EIDR, improved diagnostics and feature extraction.
Subtasks:

1. Evaluate and implement changes to EIDR API for of GRITS diagnostic needs
2. Generate keywords and rules from EIDR data to incorporate into GRITS text mining
3. Incorporate EIDR data into diagnostic model training
4. Design user interface for expert review and editing of EIDR events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with EIDR

Task 13: Connect GRITS diagnostic data filtering to the BSVE
Description: Use diagnostics to reduce data volume to relevant reports. Users should be able to list diseases or regions of interest.
Resources: EcoHealth & Kitware (GRITS integration and data filtering).
Metrics of success: GRITS will return a subset of related assets.
Subtasks:

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics
Description: Aggregate the data collected by text-mining and diagnostic algorithms to give an meta overview of a collection of reports or disease outbreak.
Resources: EcoHealth (algorithms and reporting).
Metrics of success: Number of visits per unique user to the summary report website
Deliverable: API returns summary reports to diagnostic dashboard and BSVE.
Subtasks:

1. Create algorithms for generating statistics (e.g., case counts) and visualizations (e.g., epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence
Description: EHA are experts in disease hotspot mapping. Use GRITS.db and GRITS.md to identify diseases that pose the greatest threat. Use case-counts and data from historical epidemic curves to model probable epidemic curves for new diseases.
Resources: EcoHealth (hotspots modeling).
Metrics of success: The cumulative difference between the actual epidemic curve and predicted curve. Identify hotspots for disease emergence based on diagnostics.

Deliverable: Return geocoded hotspots via API for visualization on BSVE.
Subtasks:

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Maintenance Plan

- Support the Global Rapid Identification Tool System (GRITS) on the cloud
- Develop a software process infrastructure for the GRITS developer community
- Build a robust server network to ensure uptime of the GRITS platform
- Develop a test suite to identify issues and ensure compatibility with the BSVE
- Develop user and developer documentation for the platform
- Maintain the software via a ticketing system.

V. Performance of Work

Description of Services: We shall provide all management, tools, supplies, equipment, and labor necessary to build GRITS. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data; all connected to our network of experts from digital surveillance and open source communities.

Period of Performance: Performance period for this contract will be no more than 150 days from the date of award, and will run continuously for 12 months with the provision for one time extension of this contract for an additional 12-month period.

Task 1: Connect GRITS Girder database to the BSVE (Base Period)

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities (Base Period)

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article
7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE (Base Period)

1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Build BSVE interface to GRITS with the SDK (Base Period)

1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy application

Task 5: Build mechanisms to crowd source annotations (Base Period)

1. Prepare annotation interface to allow correcting annotations
2. Write documentation of annotation interface
3. Test annotation interface and incorporate feedback
4. Develop infrastructure to identify and assign annotation tasks
5. Integrate annotation interface into Mechanical Turk or similar platform
6. Integrate and deploy citizen science platform
7. Evaluate obtained annotations and report on quality (e.g., inter-annotator agreement)

Task 6: Incorporate disease network graphs to assist diagnostics (Base Period)

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 7: Support diagnostic algorithm development with dashboard (Base Period)

1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 8: Expand diagnostic capability to arbitrary data feeds (Option Year 1)

1. Build a submission interface for users to submit arbitrary feed
2. Integrate article-processing pipeline with a translation service to process non-English articles in near real time.

Task 9: Connect GRITS to EIDR (Option Year 1)

1. Evaluate existing EIDR API against needs of recommendation system
2. Develop capacity of EIDR API to deliver historic event matches
3. Recommend EIDR events (e.g., current event is similar to past outbreak)
4. Use EIDR media to improve diagnostics and recommendation quality
5. Match GRITS data to events in EIDR (expanding from EIDs to all outbreaks)

Task 10: Update diagnostic model in near real time (Option Year 1)

1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 11: Use text mining to extend network graphs/ontologies (Option Year 1)

1. Infer set of subjects (e.g., EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups

3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g., viral strains that have mutated or developed antibiotic resistance).

Task 12: Connect EIDR collective intelligence editor to the BSVE (Option Year 1)

1. Evaluate and implement changes to EIDR API for of GRITS diagnostic needs
2. Generate keywords and rules from EIDR data to incorporate into GRITS text mining
3. Incorporate EIDR data into diagnostic model training
4. Design user interface for expert review and editing of EIDR events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with EIDR

Task 13: Connect GRITS diagnostic data filtering to the BSVE (Option Year 1)

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 14: Generate disease summary reports from diagnostics (Option Year 1)

1. Create algorithms for generating statistics (e.g., case counts) and visualizations (e.g., epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 15: Forecast disease emergence (Option Year 1)

1. Build a mathematical model of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Records: EHA shall be responsible for creating, maintaining, and disposing of only those government required records that are specifically cited in this PWS or required by the provisions of a mandatory directive listed in If requested by the Government, EHA shall provide the original record or a reproducible copy of any such record within 14 working days of receipt of the request.

Year 1			
Q1	Q2	Q3	Q4

Connect GRITS Girder database to the BSVE

Develop recommendation and decision support capabilities

Connect GRITS diagnostic and text-mining APIs to the BSVE

Prototype near-real-time processing

Build BSVE interface to GRITS with the SDK

Connect GRITS expert network (GRITS.net) to the BSVE

Test diagnostic dashboard with expert communities.

Year 2			
Q1	Q2	Q3	Q4

Enhance the expert annotation interface

Build mechanisms to crowdsource annotations

Incorporate disease network graphs to assist diagnostics

Support diagnostic algorithm development with dashboard

Expand diagnostic capability to arbitrary data feeds

Connect GRITS to GRID

Update diagnostic model in near-real-time

Use text mining to extend network graphs/ontologies.

Year 3			
Q1	Q2	Q3	Q4

Crowdsource improvements to the GRITS media diagnostic tool

Connect GRID's collective intelligence editor to the BSVE

Connect GRITS diagnostic data filtering to the BSVE

Enrich diagnostic dashboard with dynamic visualizations

Generate disease summary reports from diagnostics

Connect EcoHD to GRITS recommendations

Create a web-crawler for expanding coverage of disease reports

Forecast disease emergence

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Volume I: Technical Proposal

I. Abstract

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. We aim to enhance our current GRITS platform, developed with DTRA support, by scaling this system to handle large data volumes in near-real-time, enhancing diagnostic capabilities through network and cluster analysis, and improving visualization through use of the latest reactive web technologies. GRITS will also utilize the benefits and explore the integration of crowdsourcing, collective intelligence, and expert review. This tool will rely on automation to ingest media, extract key disease characteristics, and recommend resources, increasing the specificity of the data feed to an analyst's workflow. We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose and to connect with experts from ProMED, HealthMap and EcoHealth, thereby increasing our network of experts from digital surveillance and open source communities. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats, advancing our readiness to combat the broad class of chemical and biological threats posed by EIDs.

Keywords
disease ecology, digital diagnostics, natural language, machine learning, emergent media, network, real-time, data science

II. Scope

A. Objective

EcoHealth Alliance (EHA) proposes a Global Rapid Identification Tool System (GRITS) for diagnosing infectious disease bioevents. Our current GRITS media diagnostic tool (GRITS.md) delivers ranked differential diagnoses to pinpoint and identify disease threats more rapidly than current public health systems. Our specific objective with this proposal is to leverage the GRITS platform, developed with DTRA support since January 2013, and expand it to deliver near-real-time disease diagnostics, decision support, and data processing to the BSVE. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, all connected to our network of experts from digital surveillance and open source communities.

B. Background

The discovery of HIV/AIDS in the 1980s marked the transition from declaring victory over infectious diseases, to global increases in disease emergence and re-emergence[1]. EcoHealth Alliance (EHA) is at the forefront of organizations working to 'get ahead of the epidemic curve' by identifying these threats before the next pandemic or extinction event. Our researchers pioneered the identification of the origins of pathogens, such as Nipah virus[2], SARS[3], and MERS[4]. We constantly seek innovative approaches to target our field surveillance efforts on emerging threats[5]. To this end, the global increase in the volume of data, from the growth of the web and instrumented systems, presents both a challenge to traditional surveillance approaches and a tremendous opportunity for novel discoveries.

Various biosurveillance technologies have been developed to monitor Internet data sources, for instance, syndromic surveillance initiatives target surrogate indicators of a disease outbreak[6]. As with other sectors, such as commerce, marketing, and finance, the challenge is to manage

the expanding volume of data while identifying signals of interest[7]. In the case of EIDs, access to emergent media, including participatory, personal, and interactive media, characterized by decentralized content generation (e.g. the blogosphere, internationalization, and social media), presents an opportunity to detect early mentions of disease characteristics and anomalies of interest.

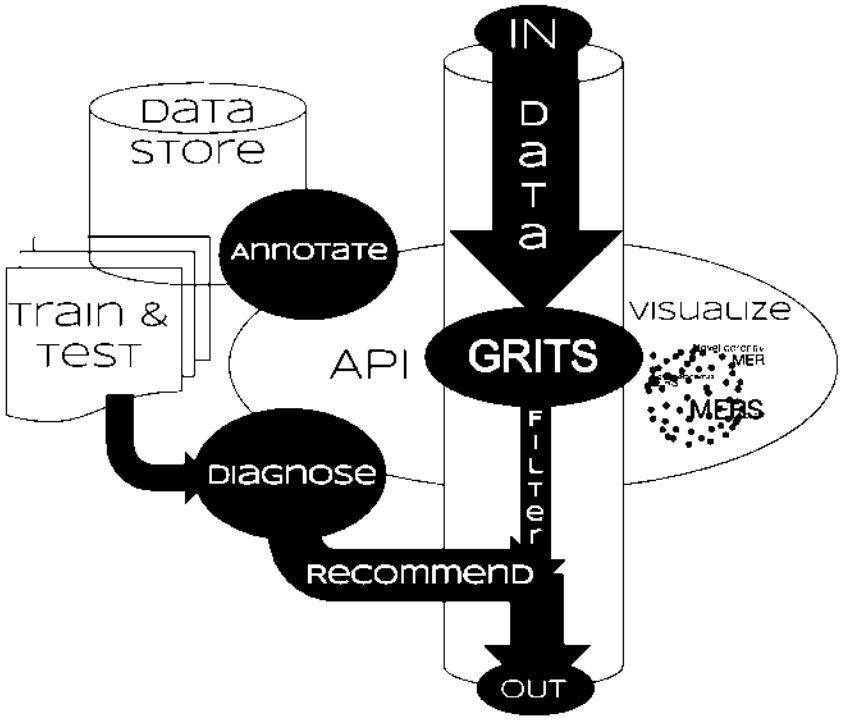
The GRITS partners are among the leading organizations in this domain. ProMED-mail (International Society of Infectious Diseases) manages a global email network of clinicians who are often among the first to identify and report disease threats[8]. Epidemico (HealthMap)[9] actively curates an expanding catalog of relevant news and social media assets. Both organizations are unique among their peers in leveraging broad networks of experts to curate and reduce the volume of media to a high-quality feed. Kitware Inc., our technical partner, has engineered sustainable communities around successful, high-impact open source scientific software.

EcoHealth assembled the GRITS team to advance the state-of-the-art in the detection and diagnosis of disease threats. GRITS combines new technologies with expert networks to apply the sciences of disease ecology and epidemiology to diagnosing big data for near-real-time disease situation awareness. We built GRITS upon pre-existing communities of expertise, rather than *de novo* technical solutions, recognizing that human experts must be integrated into the platform to ensure its intelligence and growth. In addition, we sought novel mechanisms for decision support by organizing, prioritizing, contextualizing, and linking information to relevant current and historic resources. Overall, we deploy science at the core of our systems to assemble near-real-time information in a manner that supports decision makers with diagnostic tools built by, and for, the digital disease ecology community. The diagnostic results generated by GRITS have immediate applications for risk mapping, outbreak prediction, and early warning of microbial threats.

Description of GRITS Capabilities

We take a diagnostic approach to identifying disease threats, setting research priorities, and strategically deploying our field teams. GRITS ingests and processes data feeds to provide decision support to analysts, with the following capabilities:

Diagnose - Identify the disease(s) described in a resource. Return a ranked list of diseases with quantitative metrics of certainty (differential diagnoses).
Mine - Extract the key components of document via automated analysis, collective annotation, and expert curation. Return a set of relevant information.
Recommend - Expand the materials available to the analyst. Return a collection of recommended resources that provide historic and contemporary context.
Filter - Reduce the complexity of the data feed by selecting those documents that meet diagnostic criteria of interest to the analyst. Return a filtered subset of data.
Connect - Relate the material to underlying ontologies to provide a decision framework for the analyst. Return connections to other bioevents based on underlying network structures (e.g. geography, ecology, time, host, pathogen, and environmental drivers).



Sources of GRITS biointelligence

A. Machine	Data mining, machine learning, and natural language processing
B. Expert	Elicitation, consultation, and peer review
C. Collective	Crowdsourcing annotation and human intelligence tasks

A. Machine

GRITS leverages automation to ingest, process, and return an initial diagnosis of digital media, reducing the extraneous sources of information through which experts and reviewers must sort. The GRITS text mining system extracts key disease characteristics, such as locations, case counts, and dates, for our metadata and diagnostic models. These features, which may be combined into composite features by high level rules, are based on sentence patterns and keywords chosen from third-party sources such as WordNet, Geonames, Disease Ontology, Symptom Ontology, and Biocaster Ontology. The categories we extract, such as hosts, pathogens, diseases, signs and symptoms, drivers, and transmission types, are also informed by historic disease event data curated via our GRID project, and prioritized through consultation with our experts. The GRITS diagnostic models, that use machine learning algorithms based on extracted keywords to classify articles, are trained on test articles labeled with diseases by our partners. A key function of this machine intelligence is to provide the materials and platforms to crowdsource the training data.

B. Expert

GRITS is designed to be tightly integrated with a broad network of experts who contribute relevant domain expertise ranging from disease ecology, wildlife health, epidemiology, biosurveillance, and medicine. We propose to enhance the accuracy of text mining service through expert consultation and close integration with public ontologies maintained by expert communities. We currently rely on experts to curate our content; however, we hope to close the loop by allowing BSVE users to contact these expert communities for input, including diagnostic advice, regional expertise, and language support (GRITS.net).

To fully integrate our users, we propose extending GRITS to provide more insight and flexibility in its operation. We wish to create mechanisms to edit and examine the effects of keywords on diagnosis, customize extracted features, and provide feedback on the 'best' diagnosis, thereby iteratively generating training data for the diagnostic algorithms. We also intend to test the article representations we use for classification through game-based mechanisms to identify areas for improvement in our representations. By combining a rule-based system with an algorithmic approach, the platform maintains both greater potential for expert input and easy interpretation for non-technical users.

C. Collective

The machine learning component of GRITS requires training data from portfolios of articles with disease labels and disease characteristic metadata, information collected from HealthMap and ProMed editors in order to highlight and categorize important features and relationships. These are then used to train classifiers to identify specific features of importance. To extend the range of articles we can classify, we propose using crowdsourcing methods via Amazon's Mechanical Turk and Zooniverse to generate labels and annotations for articles that do not require domain expertise.

To further enhance the accuracy of the GRITS classification algorithms, we propose crowdsourcing a diagnostic challenge, whereby we host and share our training data on an existing challenge platform (e.g. Kaggle), where programmers compete to build classifiers to improve accuracy.These approaches would compliment the models developed by our internal users and promote global citizenship in combating the scourge of emerging infectious disease. Finally, we propose integrating EHA's Global Repository for Infectious Diseases (GRID) to solicit collective intelligence and peer editing to develop a canonical collection of event data portfolios for BSVE users and the broader scientific community. The BSVE will have access to the GRID API throughout the contract period with an option to continue access through continued funding. EHA will also provide a copy of the GRID data to DTRA at the end of the contract period.

Our three-pronged approach (machine, expert, and collective) is a unique strength of the GRITS platform. Experts contribute keywords and rules to improve automated text mining tools, identify human intelligence tasks, and prioritize areas for algorithm development. Meanwhile, the automated tools enable experts to make the best use of their time by farming out less specialized tasks to the crowd, identifying errors in the data sources, and notifying editors or creating tasks to crowdsource solutions. In the case that there isn't enough data to deliver an accurate diagnosis, GRITS will identify the most useful information in distinguishing disease candidates and recommend an expert or field team to consult from our network (GRITS.net). Combined, this presents a unique conceptual model and workflow for supporting outbreak

investigation.

Proposed Development
GRITS enhances traditional search with adaptive diagnostic models, trained on a broad spectrum of resources from GRITS partners and curated by our communities of experts. This diagnostic function reduces the complexity and increases the specificity of the data feed to an analyst's workflow. We propose scaling this system to handle large data volumes in near-real-time, along with enhancing diagnostic capabilities, thereby allowing users of GRITS and the BSVE to monitor live data feeds for diseases or disease characteristics of interest. To ensure rapid diagnosis when a disease first emerges, GRITS blends social media, news media, and scientific literature. This approach may be further leveraged to identify unusual events and diagnostic gaps that may herald an emerging infectious disease of unknown etiology.

BSVE integration and benefits
We propose building an app with the BSVE SDK that allows BSVE users to submit resources to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards for decision support via additional visualizations and diagnostic tools. The GRITS interface in BSVE will connect users to experts from ProMED, HealthMap and EcoHealth. The data processing stack will provide the capabilities identified above (diagnose, mine, recommend, filter, and connect) to data being ingested or monitored by the BSVE. Our diagnostic service is designed to continually evolve and improve via mechanisms for input from collective, expert, and machine intelligence sources. Our novel approach to diagnostics builds upon traditional search with the infusion of disease ecology into the methodology.

Technical Challenges
Due to incomplete reporting, errant diagnoses, delayed onset of symptoms, and delays in laboratory results, it is difficult diagnose diseases in the early phase of an outbreak[10]. Dialect varies among data sources and there is high variability in accessibility of news sources and scientific literature. Software has a language bias where non-latin characters are often the source of bugs, and foreign language articles require translation to fit into a single NLP pipeline. Additionally, media attention is biased toward OECD countries, with blind spots in some of the locations where diseases more frequently emerge, particularly those with limited clinical infrastructure and access to health professionals[11]. However, as a shared and accessible platform that can maximize the utility of both expert networks and machine intelligence, our tool is of particular value in resource-poor areas without laboratory diagnostic facilities or, with past events, where clinical samples are no longer available. To reduce the time-lag in detecting EIDs, we are interested in identifying prompt data sources and recruiting members of the GRITS network and BSVE community in disease prone environments to provide additional reports of emerging diseases.

When attempting to respond to user submitted corrections and feedback, some classifiers take considerable time to train (e.g. neural nets), and completely retaining any classifier on big data can be prohibitive. We will need to investigate methods of incrementally retraining our classifier in a timely manner as new data is submitted.

Technical merit
Overall, we propose to expand our automated data extraction to support reporting initiatives and event notification systems with near-real-time automated extraction of disease-relevant information from an arbitrary, unstructured data feed. Further development of the GRITS text

mining system will allow us to introduce ecological and epidemiological concepts to extract more complex information such as host-pathogen relationships and quantitative data (e.g. case counts) for modeling and analysis[12]. We want to improve the precision of the features we extract by developing more sophisticated natural language processing pipelines. Additionally, we plan to reduce error rates by taking advantage of the open source NLP software ecosystem to perform word sense disambiguation and coreference resolution. Identifying the features GRITS and BSVE users value and providing channels for them to provide us with feedback will also be important to improving GRITS. We propose dynamically retraining the classification algorithm GRITS uses to diagnose diseases based on user submitted corrections to its diagnosis. Finally, we plan on open sourcing reusable components of our system so that other groups can benefit from our work.

Our technology stack consists of modern web technologies such as Meteor that allow us to seamlessly update the content of the UI in near-real-time. These frameworks are compatible with the current technologies in the BSVE, such as AngularJS. We are actively investigating distributed processing technologies, such as Storm, that would allow us to process large volumes articles in parallel. Furthermore, we employ implementations of machine learning algorithms from scikit-learn, and are using natural language processing algorithms (e.g. tokenizing, part-of-speech-tagging, lemmatization) from nltk, and CLIPS pattern. We have started with a Python ML/NLP stack because of the rich software ecosystem available, and the ability to prototype rapidly with IPython notebooks.

Scientific merit

Automated categorization of EID reports by the GRITS diagnostic classifier will enable analysts and to search and filter them, increasing the ratio of relevant information they review. Furthermore, GRITS will provide decision support by suggesting potential diseases in reports of unknown diseases, and by recommending relevant data to review and organizations to contact. An established networks of experts from EcoHealth and One Health will provide input on our diagnostic engine enabling us to continually improve upon it. Infectious disease emergence is a global-scale challenge requiring an extended, engaged community to monitor, track and respond to new threats; it is also also intrinsically interdisciplinary given the complex life histories of many disease agents.

Ontologies are invaluable tools in artificial intelligence systems, decision support systems, data exploration and research where they can be used to make complex inferences and generate rich datasets. We seek to expand the scope of our ecological ontologies by considering taxonomic, distribution, ecological niche, and networks for pathogens and hosts. This will help us provide state of the art diagnostics for the BSVE by providing structured data from which we can make inferences with GRITS diagnostic algorithms. We plan to use the biointelligence extracted from news media and submitted by GRITS users to assemble a corpus of new information to form the basis of new relationships and entities within biological ontologies to help explain patterns of disease emergence. We are interested in incorporating these relationships and entities into public ontologies they derive from or relate to so that other projects benefit from our work. Our goal, with the work we propose, is to push our system so that more components operate in near-real-time, provide recommendations of to users for additional data-sources, work with citizen scientists to expand the data inputs to diagnostic tools, and integrate various GRITS components into the BSVE community.

C. Programmatics

This effort will support DoD CBDP, DTRA, and the Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD), HDTRA1-14-CHEM-BIO-BAA, Chemical Biological Technologies Department and is submitted in response to Topic: CBA-03: Next Generation Analytic Capabilities for BSV. The work will support DTRA's mission to safeguard America and its allies from biological WMDs by providing diagnostic capabilities to reduce, eliminate, and counter microbial threats. Specifically this "Global Rapid Identification Tool System" is aimed at developing capacity for the detection of EID threats, to support protection efforts and mitigation of the threats posed by disease agents through the New Initiatives in Science and Technology program. This technology is intended for eventual transition through the DTRA R&D Enterprise.

Management plan

Our management plan blends strong scientific expertise in global EID surveillance, with agile software engineering as well as iterative and incremental rapid application development. The project will be managed by our team of data scientists and software developers at EcoHealth Alliance, in consultation with thought leaders in the field of biosurveillance (Epidemico & ProMED-mail), and infused with innovative technologies Kitware Inc., developers of leading edge, high quality software.

Key personnel (roles/responsibilities)

- EcoHealth Alliance (prime): management, delivery, software integration, computing, diagnostic analysis, data science, data mining, disease ecology
    - TBD (Principal Investigator - PI)
- Kitware Inc.: data management, visualization
    - Jeff Baumes, Ph.D. (Technical Sub-contractor)
- Epidemico: data curation, digital surveillance
    - John Brownstein, Ph.D. (Scientific Consultant)
- ProMED-mail: data curation, disease outbreak reporting
    - Larry Madoff, Ph.D. (Scientific Consultant)

Current data providers and collaborating centers:

- **ProMED-mail** - the Program for Monitoring Emerging Diseases - is an open source Internet-based reporting system dedicated to rapid global dissemination of information on outbreaks of infectious diseases and acute exposures to toxins that affect human health, including those in animals and in plants. Electronic communications enable ProMED-mail to provide up-to-date and reliable news seven days a week. Sources of information include media reports, official reports, online summaries, local observers, and others. A team of expert moderators screen, review, and investigate reports before posting to the network and distributing by email. ProMED-mail currently reaches over 40,000 subscribers in at least 185 countries.
- **Healthmap** - The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health.

- **Global Repository of Infectious Disease (GRID) project** - an EHA project describing the initial emergence of global infectious disease bioevents since 1940. We collected direct language from the primary literature describing the agent, time, place, impact, transmission, host, driver, EID category, and economics of the event to discover patterns and trends among these variables across time and space. This is used to train the models with historic context to support both our Hotspot predictive modeling efforts and diagnostic capabilities.
- **GIDEON** - Global Infectious Disease and Epidemiology Network - is the world's premier global infectious diseases knowledge management database. It contains a diagnostic module that employs information on symptoms, country, incubation period, and laboratory tests to construct a ranked differential diagnosis. The Infectious Diseases module encompasses over 340 infectious diseases, 231 countries, over 500 anti-infective drugs and vaccines.
- **PubMed, Google Scholar, and Web of Science** - will be used to generate records of confirmed diagnoses and historical outbreaks. Additionally, we hope to explore archival resources such as CDC disease reports.

D. Relevance

Our goal with this project is to develop a tool system of high-relevance to DTRA's Goals and Objectives. With the support of DTRA, we could advance our GRITS to full development and extend timely operational capability to all sectors affected by the threat of EIDs. This state-of-the-art technology will help advance our readiness to combat the broad class of biological threats posed by EIDs, including the capability to identify agents with the potential to be used as WMDs. We have the expertise and capacity to ensure useable capability of the GRITS application within the timeline of tasks we propose. The tools will provide near-real-time decision support to end-users of GRITS and the BSVE. By using open source and transparent methods, we ensure that our results are reproducible and that the technology is portable, reliable, agile, and flexible in confronting emerging threats. The tools we propose are state-of-the-art, both scientifically and technically. GRITS leverage the latest reactive web technologies (e.g. Meteor), visualization environments (e.g. WebGL and Tangelo), and scientific databases (e.g. Girder). The machine learning and clustering algorithms are drawn from Scikit-learn, an open and accessible, community-supported Python library.

A key strategy in mitigating EID risk is to build situational awareness as far forward from our shores as possible, by using advanced digital biosurveillance to detect early signals that portend the emergence of high-risk, priority diseases and pathogens, including bioterrorism agents. This biosurveillance technology is adaptable to low resource settings, among them those most vulnerable to EIDs. Ultimately we hope to empower our warfighters and allies with the tools necessary to adapt and shape the dynamic Global Security Environment, as it pertains to the acute threat of infectious diseases.

Responses to DTRA's questions from the White Paper

How will the proposed system be sustained? Is a fee for service model envisioned? If so, details should be provided.

We propose providing to DTRA all of the data hosted in GRITS.db and all of the code developed for this proposed system under permissive open source licences (e.g. MIT and Apache2). Furthermore, EHA has established the Data Science and Research Technology (DART) lab with the express goal of supporting the services outlined in this proposal. We envision sustaining the

service under a 'fee for service' model to be negotiated with DTRA upon delivery of the work. We would do so in coordination from our technical subcontractor, Kitware Inc., who have extensive experience supporting open source development for federal agencies, including DOD. Our data subcontractors have agreed to make the full data available to DTRA spanning the duration of the contract (beginning Jan 18, 2013). Where copyright restrictions limit our ability to distribute the full text of the media, we will provide programmatic tools to retrieve the text in compliance with the terms and conditions of the source. Continued access to our experts via GRITS.net, could also be negotiated with all parties under a fee for service model. Additionally, we propose a 'freemium' mechanism to sustain data hosting and processing costs, whereby DTRA-approved users or organizations could access the service on a pay-as-you-go basis (e.g. paying for characters processed or volume stored).

What will actually be delivered to the Government/BSVE? Will this simply be an API to the EHA system, or will underlying tools and data be delivered? If yes, please clearly describe all deliverables.
We are prepared to deliver all materials developed through the contract under permissive open source licenses. Given the complexity of the system, and the maintenance burden, we recommend that that the DART lab continue to maintain the materials on a mutually agreed upon third party service (e.g. AWS) and provide the access to the data and diagnostic capabilities through our API. The source code will be made available through a private Github repository. We will provide full documentation, as we have done for the data service we are currently providing to the BSVE developed by Digital Infuzion. This applies to all deliverables, including GRITS.app, GRITS.db, and GRITS.md. The GRID platform has been developed with support from other agencies, foundations, and universities; however, we will provide unlimited access in perpetuity to DTRA via the API and web interface. The source code for Tangelo visualizations Girder are publicly available on Github and permissively licensed.

III. Credentials

A. Summary of Credentials

EcoHealth Alliance (EHA):

Building on over 40 years of groundbreaking science, EHA is a global nonprofit organization dedicated to protecting wildlife and safeguarding human health from the emergence of disease. The organization develops ways to combat the effects of damaged ecosystems on human and wildlife health. Using environmental and health data covering the past 60 years, EHA's scientists created the first ever global disease hotspots map that identified at-risk regions, to help predict and prevent the next pandemic crisis. That work is the foundation of EHA's rigorous, science-based approach, focused at the intersection of the environment, health and capacity building. Working in the U.S. and more than 20 countries worldwide, EHA's strength is founded on innovations in research, training, global partnerships, and policy initiatives.

EHA is a partner of the USAID Emerging Pandemic Threats PREDICT program, a $75 million effort focused on predicting and preventing pandemic diseases. PREDICT is building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people (zoonotic diseases). PREDICT has developed a SMART surveillance method (Strategic, Measurable, Adaptive, Responsive, and Targeted) that accounts

for the fact that zoonotic pathogens, such as influenza and SARS, are responsible for the majority of emerging infectious diseases in people, and that more than three quarters of these emerging zoonoses are of wildlife origin. The SMART surveillance approach is designed to detect novel diseases with pandemic potential early, giving health professionals the best opportunity to prevent emergence and spread. It also targets sentinel animal species at active human interfaces in hotspot regions to improve surveillance efficiency.

The PREDICT team builds on a broad coalition of partners to develop the global capacity to monitor diseases at the animal-human interface and develop a risk-based approach to concentrate these efforts in surveillance, prevention, and response at the most critical points for disease emergence from wildlife.

PREDICT project objectives:

- Assess local surveillance capacity;
- Implement targeted and adaptive wildlife disease surveillance systems;
- Develop and deliver new technologies to improve efforts close to the source;
- Use cutting-edge information management and communication tools to bring the world closer to realizing an integrated, global approach to emerging zoonotic diseases.

Partners:

HealthMap/Epidemico

Healthmap is a team of researchers, epidemiologists and software developers based out of the Children's Hospital, Boston. Founded in 2006, Healthmap is an established global leader in utilizing online informal sources for disease outbreak monitoring and real-time surveillance of emerging public health threats. The freely available Web site 'healthmap.org' and mobile app 'Outbreaks Near Me' deliver real-time intelligence on a broad range of emerging infectious diseases for a diverse audience including libraries, local health departments, governments, and international travelers. HealthMap brings together disparate data sources, including online news aggregators, eyewitness reports, expert-curated discussions and validated official reports, to achieve a unified and comprehensive view of the current global state of infectious diseases and their effect on human and animal health. Through an automated process, updating 24/7/365, the system monitors, organizes, integrates, filters, visualizes and disseminates online information about emerging diseases in nine languages, facilitating early detection of global public health threats.

ProMED

ProMED-mail was established in 1994 with the support of the Federation of American Scientists and SatelLife. Since October 1999, ProMED-mail has operated as an official program of the International Society for Infectious Diseases, a nonprofit professional organization with 20,000 members worldwide.

Kitware, Inc.

Kitware, Inc. creates and supports leading edge, high quality software in the fields of computer vision, medical imaging, visualization, 3D data publishing, and technical software development. Kitware employs an open source development model to foster extended, collaborative communities, and an open source business model to provide flexible, low-cost technical solutions. The Company's services and products include technology integration, software

support, consulting, custom application development, and training and productivity tools that leverage our open-source software systems.

B. Summary of Qualifications for PI and Key Personnel

TBD (PI), will lead the Data Science and Research Technology group at EcoHealth Alliance. EcoHealth Alliance is currently in the process of filling this role, and we will provide an update as soon as possible. The PI will have a background in ecology and health, as well as expertise managing technical projects, and candidates will be reviewed by DTRA to ensure that they are qualified. The PI and the team will contribute expertise in geospatial data and analysis of the ecological origins of infectious disease emergence and digital disease surveillance.

Dr. John Brownstein is an Associate Professor at Harvard Medical School and directs the Computational Epidemiology Group at Children's Hospital Informatics Program in Boston. His group is supported by a multi-million dollar budget with support from NIH (NLM and NIAID), USAID, Centers for Disease Control and Prevention, and Google.org. He has pioneered efforts in participatory epidemiology, using statistical and informatics approaches aimed at improving public health surveillance and practice. He recently was awarded the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the United States government to outstanding scientists and engineers.

Dr. Lawrence Madoff is an infectious disease physician whose career has been devoted to disease surveillance. Dr. Madoff is the Editor of ProMED-mail, which uses Internet-based communication and social media to detect and report emerging infectious diseases globally. He is currently Director of the Division of Epidemiology and Immunization at the Massachusetts Department of Public Health, which oversees infectious disease surveillance and immunization activities in the state. He is a fellow of the American College of Physicians and a Fellow of the Infectious Disease Society of America.

Dr. Jeff Baumes is a technical lead at Kitware Inc. He has significant expertise in information analysis and presentation. His contributions include novel graph clustering algorithms that allow cluster overlap, and algorithms for discovering subsets of individuals persistently connected over time. Over the last six years, he has been a major technical contributor to the open source Titan scalable analysis and visualization toolkit, which is an extension of the Visualization Toolkit to include informatics and information visualization capabilities. He has worked on projects in several fields surrounding Titan such as text analysis, bioinformatics, and social network analysis including funding from NSF, DOD, DOE, and NIH.

C. Summary of Facilities to Perform the Proposed Work

Facilities at EcoHealth Alliance (EHA)

EcoHealth Alliance (EHA) is a 501(c)(3) nonprofit organization that specializes in scientific research on the causes, origins, and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory. A core administrative staff of 11 employees support EHA's scientific team (15 core scientists, 100+ field staff) and are available for work on this project through foundation support. EHA is equipped with 25 networked PCs including ARRA funded International Live Meeting Video Conferencing facilities.

EHA has access to multiple servers, server support, and all necessary software on Mac, Linux, and Windows operating systems. Additional computing power is acquired from commercial cloud providers to meet project needs.

EHA has an active program of staff development and this is reviewed and adjusted annually as part of each employee's evaluation process. Specific provisions are made for internal training and external training resources, tuition support programs via a partnership with Columbia University, and active support of staff to spend time in collaborators organizations. All early stage investigators are mentored to provide guidance in research practices, grant management, administration and project management. Financial support from EHA core funds are available to support external tuition, travel to conferences and to conduct joint research in collaborator's institutions. There is no obligation for teaching time at EHA and all research staff are funded for 100% research time, however, there is a provision, through partnership with Columbia University, to enable staff to teach at the undergraduate and graduate level, with monetary support provided by Columbia University. Administration and other staff are supported in their efforts to enhance their careers by the provision of tuition fees for external courses, travel funds for conferences, and time off their core activities.

Facilities at Kitware Inc.
Kitware Inc. is headquartered just north of Albany, New York in a Clifton Park office complex. Kitware rents approximately 27,000 square feet of office space at this location. Kitware also has an office in Chapel Hill, North Carolina approximately 6,200 square feet in size. Both offices are linked via a common virtual private network and a shared phone system, and share financial and administrative personnel. They also have on-site office managers, lunchrooms, private meeting rooms, and advanced conference facilities including large screen projection systems and whole-room Polycom video conferencing systems. The proposed work will be performed at the Clifton Park site.

Kitware has a mixed environment of personal and shared computing platforms. Employees average three computers per person (desktop, laptop, and/or home system), with each computer typically equipped with multiple multi-core processors, a high-performance graphics card, dual monitors, and 8GB or more of main memory. These personal systems run a mix of Windows, Mac OS X, and Linux operating systems. Shared resources include compilation and testing farms as well as workstations running a variety of alternative operating systems for testing purposes, e.g., Windows XP or Vista. Kitware also maintains several servers to provide public access to the open source VTK, ITK, TubeTK, Titan, Slicer, CMake, and ParaView systems; to host web pages and web services for open source communities such as NA-MIC and Visomics; to operate open-access journals such as the Insight Journal and the Midas journal which has hosted workshop papers for nearly ten years; and to provide access to massive collections of public data for computer vision and medical imaging algorithm evaluation. Access to these systems is provided by a fiber connection to the internet yielding a total of 100 Mbit/second data rate.

Kitware hosts several special-purpose, high-end workstations, GPU systems, haptic systems, and magnetic and optical trackers. One such workstation is a multi-GPU computer featuring 6 NVidia GPU boards: 5 C2050 Tesla and 1 Quadro 5000 Fermi, as well as a 6-Core X5680

3.33GHz processor. A noteworthy haptic system is a MBP Freedom 7S haptic device, configurable for 6 or 7 degrees of freedom. To address large-scale distributed computing, the company maintains several clusters for development and testing. The clusters include: a twelve node testing cluster running mixed Linux and Windows operating systems; a four node Windows cluster with a gigabit Ethernet network; and a seven node Linux cluster with dual 64-bit Xenon processors, high-end graphics accelerators, and an Infiniband network driving a 3x2 PowerWall display. Kitware also has access to several external computer systems (e.g. HP, IBM, and Intel) through various vendor partnership programs.

IV. WORK TO BE PERFORMED.

A. General

Our goal over the 3-year time period is to expand our DTRA-funded GRITS platform to deliver near-real-time disease diagnostics, decision support, and data processing. These enhanced capabilities will be powered by GRITS analytics, visualizations, and data, and connected to our network of experts from One Health, EcoHealth, and open source communities.

We are currently building a robust and scalable software infrastructure to provide a diagnostic decision support system for analysts with multiplier effects by connecting to a community of experts and data from EcoHealth Alliance, HealthMap, and ProMED-mail. The final deliverable will include our user interface (GRITS.app), application interface (GRITS.api), network of experts (GRITS.net), media diagnostics (GRITS.md), and database (GRITS.db). Overall, GRITS will be deployable and generalized application that will output probabilities and lists of pathogens likely responsible for an outbreak on the basis of user-provided data. Accordingly, the resource will be adaptable to a specific organization or agency's needs or emerging threats, and geographic areas of high concern. The source code for this algorithm will be made available to interested parties for further development and adaptation.

The original Rapid Identification Tool (RIT) prototype was developed by manually extracting symptoms from encephalitides reports in ProMED-mail to train a diagnostic model. Through rigorous testing, we identified modeling approaches that improved performance by combining natural language processing and machine learning algorithms. We recognized automated data collection and crowdsourced data curation would be needed to scale to disease coverage and diagnose additional diseases with greater precision. The GRITS diagnostic dashboard provides decision support to experts at our partner organizations by automatically extracting and visualizing information from media. We leverage crowdsourcing techniques by providing experts with tools for curating disease portfolios and annotating articles. We have developed an application programming interface (API) for access to our data and diagnostics by third party developers and users. Additionally, we integrated the project with an ongoing EHA initiative to collect historical disease outbreak data (Global Repository for Infectious Diseases - GRID). Finally, we integrated work from our colleagues at Kitware to support the storage and visualization of the large, complex datasets being generated.

During the proposed contract period, we will improve the accuracy and robustness of the GRITS media diagnostics. We will design new visualizations for the diagnostic dashboard to allow users to gain additional insights into our data and tools; develop a near-real-time processing stack to enable our visualizations and diagnostics to use the latest information; gain additional

advantages from our collective intelligence network by adding new mechanisms for experts to provide feedback and interact with our underlying data, rules, and algorithms; experiment with crowdsourcing as an additional source of training data and knowledge to further improve GRITS.md; and expand the capabilities of the system to provide decision support and recommendations to analysts.

By the end of the contract period GRITS will provide:

1. Robust architecture for near-real-time diagnostics and data processing
2. Interface from BSVE to GRITS with SDK
3. Healthmap, ProMED-mail, and EcoHealth data to the BSVE
4. Machine, expert, and community intelligence

Diagnostic modeling
We plan to use the biointelligence extracted from news media and submitted by GRITS users to form the basis of new relationships and entities within biological ontologies that link EID events, diseases, symptoms, hosts, and other entities and attributes related to infectious diseases together in a rich network structure. This ontology will be a critical data source for making domain specific inferences in diagnostic algorithms.

Data Storage and Management
Girder is a data management platform built to meet the needs of distributed, data-centric web applications. Girder is a modular framework that allows developers to build systems that use any or all of the components necessary to create a system tailored to their needs. All data sharing web applications need the same core functionality: upload, download, large data storage, supplemental metadata storage and indexing, authentication/authorization, a RESTful API, and an extensible plugin architecture. Girder provides these components and is currently being used for GRITS as well as several DOE projects.

Visualization
Tangelo is a system for rapid production of visual and interactive web applications. Using HTML5 standards such as SVG, WebGL, and 2D canvas, Tangelo integrates visualization modes spanning charts, hierarchical diagrams, and networks for time series, heterogeneous, or multivariate data. Tangelo provides interfaces to powerful visualization libraries such as GeoJS, ParaViewWeb, and D3.

B. Summary

Year 1 (2015)

1. Connect GRITS Girder database to the BSVE
2. Develop recommendation and decision support capabilities
3. Connect GRITS diagnostic and text-mining APIs to the BSVE
4. Prototype near-real-time processing
5. Build BSVE interface to GRITS with the SDK
6. Connect GRITS expert network (GRITS.net) to the BSVE

Year 2 (2016)

7. Build mechanisms to crowdsource annotations

8. Incorporate disease network graphs to assist diagnostics
9. Support diagnostic algorithm development with dashboard
10. Expand diagnostic capability to arbitrary data feeds
11. Connect GRITS to GRID
12. Update diagnostic model in near-real-time
13. Use text mining to extend network graphs/ontologies.

Year 3 (2017)

14. Crowdsource improvements to the GRITS media diagnostic tool
15. Connect GRID's collective intelligence editor to the BSVE
16. Connect GRITS diagnostic data filtering to the BSVE
17. Enrich diagnostic dashboard with dynamic visualizations
18. Generate disease summary reports from diagnostics
19. Forecast disease emergence

C. Detailed Tasks

Task 1: Connect GRITS Girder database to the BSVE
Description: Coordinate with BSVE developers to provide API access to GRITS database (HealthMap, ProMED and EcoHealth data with diagnostic metadata).
Resources: EcoHealth & Kitware (API, BSVE support), HealthMap & ProMED (data)
Metric(s) of success: BSVE access to GRITS data via API
Deliverable: API key and access for the BSVE team, communication between BSVE/GRITS
Subtasks:

1. Solicit feedback on GRITS data API from BSVE team
2. Create API key generation and assignment infrastructure for GRITS
3. Connect Girder data storage to API key infrastructure
4. Incorporate feedback from the BSVE team into GRITS API
5. Generate documentation for API access

Task 2: Develop recommendation and decision support capabilities
Description: Use our GRITS.md to extract features of incoming articles to inform media recommendations for analysts based on areas or keywords of interest or a collection of documents being evaluated. Identify targets for data collection that would most enhance diagnostic capabilities for a particular event.
Resources: EcoHealth (algorithms and infrastructure), Kitware (storage & visualization), HealthMap & ProMED (testing)
Metrics of success: Recommendation system returns relevant articles, people and organizations. Adding recommended information improves diagnosis.
Deliverable: API and diagnostic dashboard interface to recommendations
Subtasks:

1. Set up job to extract and store features of incoming articles
2. Provide recommendations based on keywords
3. Recommend similar articles based on an article or portfolio
4. Create mechanism for people and organizations to opt in to be recommended
5. Recommend people or organizations based on keywords, articles, or portfolios
6. Identify missing features that differentiate between top diagnoses for an article

7. Connect recommendation system to API

Task 3: Connect GRITS diagnostic and text-mining APIs to the BSVE
Description: Provide BSVE developers with API access to GRITS media diagnostics and text mining tools and support them as they integrate these features into the BSVE interface.
Resources: EcoHealth (API development, BSVE support)
Metrics of success: BSVE team satisfied with API structure. GRITS features and diagnoses accessible through BSVE.
Deliverable: API access for the BSVE team, communication between BSVE/GRITS.
Subtasks:
1. Connect diagnosis and text-mining to API infrastructure
2. Write documentation on diagnosis and text mining APIs for BSVE team
3. Incorporate feedback from the BSVE team into GRITS API
4. Support BSVE team as they integrate GRITS extracted features and diagnostics

Task 4: Prototype near-real-time processing
Description: Develop near-real-time architecture based on ideas from the lambda architecture, which allows high-performance integration of near-real-time streaming data with pre-processed data. Evaluate possible software tools for each component. Set up prototype of software stack.
Resources: EcoHealth & Kitware (architecture, software evaluation, prototyping)
Metrics of success: Working prototype
Deliverable: Documentation of software architecture and choices, working prototype
Subtasks:
1. Research lambda architecture
2. Develop near-real-time software architecture diagram and documentation
3. Evaluate options for near-real-time streaming data (e.g. Storm, Summingbird)
4. Evaluate options for pre-processing data (e.g. MapReduce, Spark)
5. Evaluate options for automated polling (e.g. Huginn, Luigi, Celery)
6. Investigate adaptive polling algorithms
7. Build prototype of near-real-time software architecture

Task 5: Build BSVE interface to GRITS with the SDK
Description: Build an app on the BSVE SDK that allows BSVE users to submit text to diagnose. The app will display a basic visualization of a diagnosis, and provide links to diagnostic dashboards where users can see additional visualizations and interact further with GRITS diagnostic tools.
Resources: EcoHealth (app development & testing)
Metrics of success: Users able to access GRITS through app deployed to BSVE
Deliverable: Deployed app, BSVE users able to access diagnostic dashboards
Subtasks:
1. Obtain and review SDK documentation from BSVE
2. Develop backend component to access GRITS API
3. Set up mechanism for BSVE users to authenticate and/or register with GRITS
4. Develop frontend component to allow submission
5. Develop frontend component to provide diagnosis and dashboard links
6. Coordinate with BSVE to deploy app

Task 6: Connect GRITS expert network (GRITS.net) to the BSVE

Description: GRITS is a bridge to experts from ProMED, HealthMap and EcoHealth. Two-way communication will benefit both BSVE and GRITS. We will develop mechanisms for BSVE users to submit requests for language, region, and diagnostic feedback, while allowing experts and organizations to opt-in and set availability to handle requests.
Resources: EcoHealth (experts and interface), ProMED and HealthMap (expertise)
Metrics of success: BSVE user can submit request to a GRITS expert. Language, region, and diagnostic expertise is available to DTRA and BSVE users.
Deliverable: BSVE interface through GRITS app to submit requests to experts
Subtasks:

1. Evaluate needs of BSVE users for expert feedback
2. Develop a messaging service to expert network
3. Design interface for posting requests and submitting materials
4. Tie messaging system into existing GRITS partner dashboards and routing

Task 7: Build mechanisms to crowdsource annotations
Description: Identify human intelligence annotation tasks for crowdsourcing by citizen scientists and Amazon's Mechanical Turk
Resources: EcoHealth (annotation interface), Mechanical Turk (pay for annotations), Citizen Scientists (volunteers)
Metrics of success: Annotations crowdsourced. Improves diagnostics from annotations.
Deliverable: Crowdsourced annotations incorporated into GRITS training data
Subtasks:

1. Develop infrastructure to identify and assign annotation tasks
2. Integrate annotation interface into Mechanical Turk or similar platform
3. Integrate and deploy citizen science platform
4. Evaluate obtained annotations and report on quality (e.g. inter-annotator agreement)

Task 8: Incorporate disease network graphs to assist diagnostics
Description: Model the geographic, ecological, and information structure of infectious disease networks and connect them to diagnostic API. Develop visualizations for diagnostic dashboard.
Resources: EcoHealth & Kitware (network modeling, visualization)
Metrics of success: Improved diagnostics from network reasoning
Deliverable: Visualizations of the network model in the diagnostic dashboard
Subtasks:

1. Develop features to extract from texts and map to ontologies
2. Develop geographic, ecological, and transportation network graphs
3. Develop information network graph
4. Build graph visualizations with Tangelo
5. Develop tool to identifies 'blind spots' in the information network

Task 9: Support diagnostic algorithm development with dashboard
Description: Support multiple models for diagnosis, and continually reevaluate their effectiveness. Different algorithms may perform differently with time, origin, or diseases. Allow users to run and compare the results of different models via the diagnostic dashboard. Run automated jobs to compare the performance of models over time.
Resources: EcoHealth & Kitware (algorithm and interface development)
Metrics of success: Run and compare models from the dashboard
Deliverable: Capacity to compare model performance in the dashboard

Subtasks:
1. Develop infrastructure for training multiple machine learning algorithms
2. Create interface to select algorithms and compare results
3. Create interface for selecting algorithm parameters
4. Automate algorithms and record performance

Task 10: Expand diagnostic capability to arbitrary data feeds
Description: Develop robust scraping algorithms and provide an interface for users to connect data sources to GRITS.
Resources: EcoHealth (algorithms), Language translation service
Metrics of success: Users can submit relevant feeds to the GRITS system
Deliverable: Interface for submitting data feeds
Subtasks:
1. Build a submission interface for users to submit arbitrary feed
2. Integrate article processing pipeline with a translation service to process non-English articles in near-real-time.

Task 11: Connect GRITS to GRID
Description: Incorporate GRID dataset into GRITS to give the platform a comprehensive historical perspective on EIDs and enhance analytic capabilities around drivers of disease behavior. Extend the recommendation system to include historic context from GRID (e.g. media and data). Use historic event data to expand to match targets for a disease or keyword.
Resources: EcoHealth (recommendation system, GRID)
Metrics of success: Diagnostic decision support enriched by **historic event data**
Deliverable: Improved recommendation system, match new reports with historic events
Subtasks:
1. Evaluate existing GRID API against needs of recommendation system
2. Develop capacity of GRID API to deliver historic event matches
3. Recommend GRID events (e.g. current event is similar to past outbreak)
4. Use GRID media to improve diagnostics and recommendation quality
5. Match GRITS data to events in GRID (expanding from EIDs to all outbreaks)

Task 12: Update diagnostic model in near-real-time
Description: Retrain the classifier with new reports from HealthMap/ProMED or users submissions. Classify labeled training data with GRITS, for example correcting misclassification. Investigate classifiers capable of distributed training or incremental retraining.
Resources: EcoHealth (algorithm and architecture development)
Metrics of success: Model updates improve performance. Near-real-time classifier updates.
Deliverable: Enhanced classification infrastructure, retraining interface
Subtasks:
1. Create a service for retraining the classifier with new labeled data
2. Research distributed training and incremental retraining algorithms
3. Add features to the UI that allow users to confirm or correct classifications

Task 13: Use text mining to extend network graphs/ontologies
Description: Use features extracted from disease reports to add entities and relationships to a disease network ontology. For example, linking case counts to locations.
Resources: EcoHealth (feature extraction and ontologies)

Metrics of success: Accuracy of entities and relationships extracted from our data sources.
Deliverable: An extended ontology generated by text-mining algorithms
Subtasks:

1. Infer set of subjects (e.g. EID events) and predicates (hasCase, reportedBy)
2. Create feature extractors for interesting subject-predicate-object groups
3. Use named entity classification or related technologies to identify diseases and disease attributes that are unknown to our system in advance (e.g. viral strains that have mutated or developed antibiotic resistance).

Task 14: Crowdsource improvements to the GRITS media diagnostic tool
Description: Sponsor public challenges (e.g. Kaggle) to solicit improvements to the GRITS media diagnostic by training better classifiers or by submitting additional training data.
Resources: EcoHealth (challenge planning and execution)
Metrics of success: User submits an improvement with better performance (e.g. higher f-score)
Deliverable: Improved diagnostic tool from crowdsourced algorithms.
Subtasks:

1. Evaluate challenge platforms
2. Create a subset of data for crowdsourcing
3. Open source a base classifier example
4. Create challenge on selected platform
5. Publicize and run challenge

Task 15: Connect GRID collective intelligence editor to the BSVE
Description: Incorporate BSVE users as experts for the review and editing GRID events
Resources: EcoHealth (GRID)
Metrics of success: BSVE users contribute to GRID. Diagnostic models improve from GRID data. Additional features are extracted based on GRID data.
Deliverable: BSVE/GRITS access to GRID, improved diagnostics and feature extraction
Subtasks:

1. Evaluate and implement changes to GRID API for of GRITS diagnostic needs
2. Generate keywords and rules from GRID data to incorporate into GRITS text mining
3. Incorporate GRID data into diagnostic model training
4. Design user interface for expert review and editing of GRID events
5. Implement expert review and editing interface
6. Set up mechanism for registering and authenticating BSVE users with GRID

Task 16: Connect GRITS diagnostic data filtering to the BSVE
Description: Use diagnostics to reduce data volume to relevant reports. Users should be able to list diseases or regions of interest.
Resources: EcoHealth & Kitware (GRITS integration and data filtering)
Metrics of success: GRITS will return a subset of related assets
Subtasks:

1. Generate diagnostic rules to match regions and diseases of interest
2. Test filtered results with experts to determine accuracy of filtering
3. Add near-real-time diagnostic filtering to GRITS API

Task 17: Enrich diagnostic dashboard with dynamic visualizations

Description: Add dynamic Tangelo visualizations, including interactive dendrogram views of likely diseases, multidimensional visualization of report space, and flexible geovisualizations with interactive vector graphics for high-performance imagery and dense data.
Resources: EcoHealth (GRITS integration), Kitware (visualizations)
Metrics of success: Visualizations enrich expert decisions on diagnosis
Subtasks:
1. Develop dendrogram visualization
2. Develop multidimensional visualizations
3. Develop flexible geovisualizations

Task 18: Generate disease summary reports from diagnostics
Description: Aggregate the data collected by text-mining and diagnostic algorithms to give an meta overview of a collection of reports or disease outbreak.
Resources: EcoHealth (algorithms and reporting)
Metrics of success: Number of visits per unique user to the summary report website
Deliverable: API returns summary reports to diagnostic dashboard and BSVE
Subtasks:
1. Create algorithms for generating statistics (e.g. case counts) and visualizations (e.g. epidemic curves) to include in the summary report.
2. Integrate diagnostic filtering to identify data sources for the summary report

Task 19: Forecast disease emergence
Description: EHA are experts in disease hotspot mapping. Use GRITS.db and GRITS.md to identify diseases that pose the greatest threat. Use case-counts and data from historical epi curves to model probable epi curves for new diseases
Resources: EcoHealth (hotspots modeling)
Metrics of success: The cumulative difference between the actual epi curve and predicted curve. Identify hotspots for disease emergence based on diagnostics.
Deliverable: Return geocoded hotspots via API for visualization on BSVE
Subtasks:
1. Build a mathematical model of of disease emergence that incorporates GRITS networks
2. Create a geo visualization for GRITS dashboard
3. Add geocoded hotspot data to the API

Maintenance Plan
- Support the Global Rapid Identification Tool System (GRITS) on the cloud
- Develop a software process infrastructure for the GRITS developer community
- Build a robust server network to ensure uptime of the GRITS platform
- Develop a test suite to identify issues and ensure compatibility with the BSVE
- Develop user and developer documentation for the platform
- Maintain the software via a ticketing system.

V. Performance of Work

Year 1			
Q1	Q2	Q3	Q4

Connect GRITS Girder database to the BSVE

Develop recommendation and decision support capabilities

Connect GRITS diagnostic and text-mining APIs to the BSVE

Prototype near-real-time processing

Build BSVE interface to GRITS with the SDK

Connect GRITS expert network (GRITS.net) to the BSVE

Test diagnostic dashboard with expert communities.

Year 2			
Q1	Q2	Q3	Q4

Enhance the expert annotation interface

Build mechanisms to crowdsource annotations

Incorporate disease network graphs to assist diagnostics

Support diagnostic algorithm development with dashboard

Expand diagnostic capability to arbitrary data feeds

Connect GRITS to GRID

Update diagnostic model in near-real-time

Use text mining to extend network graphs/ontologies.

Year 3			
Q1	Q2	Q3	Q4

Crowdsource improvements to the GRITS media diagnostic tool

Connect GRID's collective intelligence editor to the BSVE

Connect GRITS diagnostic data filtering to the BSVE

Enrich diagnostic dashboard with dynamic visualizations

Generate disease summary reports from diagnostics

Connect EcoHD to GRITS recommendations

Create a web-crawler for expanding coverage of disease reports

Forecast disease emergence

VI. References

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AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 16

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA1-14-1-0029	28 May 2014	

5. ISSUED BY CODE HDTRA1	6. ADMINISTERED BY (If other than Item 5) CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	**See Item 5**

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR CODE HDTRA1	12. PAYMENT WILL BE MADE BY CODE HQ0337
DEFENSE THREAT REDUCTION AGENCY/J3CTB JEAN RICHARDS 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182266 COLUMBUS OH 43218-2266

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	**See Schedule**

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				
				15G. TOTAL AMOUNT OF CONTRACT	**$992,699.00**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
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X	A	SOLICITATION/ CONTRACT FORM	1		I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 4			**PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS**	
X	C	DESCRIPTION/ SPECS./ WORK STATEMENT	5 - 10	X	J	LIST OF ATTACHMENTS	16
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	11		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	12				
X	G	CONTRACT ADMINISTRATION DATA	13 - 15		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [X] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ REF: HDTRA-09-14-FRCWD BAA including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	28-May-2014

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		992,699	Lot	$1.00	$992,699.00
	Understanding Rift Valley Fever FFP Base Year: Grantee shall perform all work IAW the SOW in Section C of this document. FOB: Destination				
				NET AMT	$992,699.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101			Lot		$0.00
	Base Year Funding only FFP Base Year Funding only FOB: Destination				
				NET AMT	$0.00
	ACRN AA CIN: CTB12254000101				$992,699.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		978,784	Lot	$1.00	$978,784.00
OPTION	Understanding Rift Valley Fever FFP Option Year 1: Grantee shall perform all work IAW the SOW in Section C of this document. FOB: Destination				
				NET AMT	$978,784.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		970,536	Lot	$1.00	$970,536.00
OPTION	Understanding Rift Valley Fever FFP Option Year 2: Grantee shall preform all work IAW the SOW in Section C of this document. FOB: Destination				
				NET AMT	$970,536.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		996,147	Lot	$1.00	$996,147.00
OPTION	Understanding Rift Valley Fever FFP Option Year 3: Grantee shall perform all work IAW the SOW in Section C of this document. FOB: Destination				
				NET AMT	$996,147.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		998,193	Lot	$1.00	$998,193.00
OPTION	Understanding Rift Valley Fever FFP Option Year 4: Grantee shall perform all work IAW the SOW in Section C of this document. FOB: Destination				
				NET AMT	$998,193.00

Section C - Descriptions and Specifications

STATEMENT OF WORK

Project Title: Understanding Rift Valley Fever in Republic of South Africa

Document Date: July 1, 2013

Objective: The objective of this grant is to build a collaborative partnership with South African scientists and managers to study important aspects of Rift Valley fever virus (RVFV) epidemiology and ecology that have been neglected by previous research on the continent. The project is designed to strengthen South Africa's leadership role within the African continent for the study and control of RVFV and other vector-borne diseases. This work is vital to understanding how to manage animal populations, protect people, when and how to use vaccination protocols, and ways to reduce the risk of the virus spreading outside of Africa. It also provides the baseline data needed to better predict the spread of the virus should it ever be introduced into the United States and strengthens scientific partnerships in the region, thereby fulfilling DTRA's mandate of reducing the threat of the introduction and maintenance of a select agent into the United States.

Scope: The grantee proposes the first comprehensive study of the implications of vertebrate immunity at multiple scales, including the effect of vaccination, vector transmission dynamics and climate-ecology on RVFV ecology between and during epizootics. Grantee shall investigate RVFV life cycle, transmission by mosquitos, and immunity in domestic and wild ruminants, and humans, paired with vegetation and climate data, to increase our understanding of these integrated aspects through a One Health approach. The grantee team shall focus on the following major goals and milestones:

1. Improve the capacity for South Africa to be a regional leader in vector-borne diseases and Rift Valley fever virus epidemiology.
    - Establish collaborations of stakeholders, training of local technical personnel, training of graduate students and post-doctoral fellows, and improve official disease reporting to local and international authorities, publishing and sharing of project findings.
2. Determine how immunity against RVFV may change over time in domestic and wild ruminants (vaccinated and non-vaccinated) and be altered by animal management approaches.
    - Establish study protocols, implement and maintain field studies at individual and population scales, including the use of vaccines to simulate exposure and conduct laboratory analyses.
3. Determine the herd immunity status of free-ranging wildlife, wildlife from game farms and domestic animals in a 200Km^2 study region.
    - Establish implement and maintain field studies and conduct laboratory analyses.
4. Determine how mosquito abundance relates to weather in South Africa, the percentage of mosquitoes carrying RVFV and which ruminant species these vectors are biting.
    - Establish study protocols, implement and maintain mosquito field studies, collate weather/climate data, extend vector studies in OY4 and OY5 to examine variability between years.
5. Determine the current seroprevalence of RVFV antibodies in people working on the study farms and detect inter-epidemic transmission to people if it is occurring.
    - Improve the understanding of the widespread effect of previous RVFV outbreaks in people from the study area.

This integrated approach represents the most comprehensive project to date to understand the epidemiology and ecology of RVFV. It is likely that herd immunity within the entire ruminant community (wild and domestic) plays a role in whether an outbreak occurs given the

appropriate climatic conditions. The proposed immunity studies combined with transmission and succession data collected from mosquitoes during this project will demonstrate their relationship with the occurrence of an outbreak. This work in conjunction with a better understanding of current exposure levels and possible inter-epidemic transmission in people will improve the ability of scientists, local stakeholders and policy makers to prevent potential RVFV outbreaks. This research will have a **direct impact** on methods of managing ruminants, mosquitoes and mitigating risks to reduce or prevent future outbreaks and will likely be transferable to other nations in southern or all of Africa. It will also better inform policy makers in the U.S. to develop contingency plans should a RVF outbreak occur on American soil.

Our research will be centered in the Republic of South Africa (RSA), in areas with heightened risk of RVFV outbreaks (based on prior and future potential for occurrence). Collaborators from five RSA governmental and academic institutions (RSA National Institute for Communicable Diseases (NICD), RSA National and State Veterinary Services, RSA National Parks (SANParks), RSA Department of Defense, and University of Pretoria), as well as RSA private and livestock game ranchers, will play active and key roles in all components of the project, including study design, training, sampling, testing, and data analysis and information dissemination. The extensive involvement of South African partners will enable opportunities to advance RSA as a leader in vector-borne disease research. The proposed project duration is three years, with two optional years to allow for further advancement of research.

Background:

Rift Valley fever (RVF) is an emerging infectious disease that presents a formidable challenge for global public health and livestock producers. Its causative agent, RVF virus (RVFV) is listed as a pathogen of significant concern with the potential for international spread by several national and international defense, health and agricultural agencies, including the US DoD and CDC, WHO, and FAO. In addition to the potential risk of spread to the U.S. (intentionally or unintentionally), the virus causes large, devastating epizootics in Africa, inducing high rates of abortions in pregnant domestic ruminants, and over 90% mortality in juveniles. In addition to the economic and nutritional impacts on humans from livestock loss, transmission to humans occurs either through contact with bodily fluids and tissues of infected livestock, or via the bite of an infected mosquito. Though human infection with RVFV may be mild, it can cause hemorrhagic, neurological or hepatic disease. In recent years, RVFV has been demonstrated to cross the Red Sea, resulting in outbreaks in Yemen and Saudi Arabia.

On the basis of our project partners' work, climate has been used as a predictor of RVF outbreak occurrence and control. However, climate prediction models have not been paired with basic research necessary for understanding of the vector life cycle and its role in RVF maintenance, and the transmission pathways and immunological dynamics of RVFV. As a result, prevention and control strategies are insufficient to adequately prepare for current and potential RVF risks. Thus, there is great need to better elucidate the underlying mechanisms of RVF, especially given the potential for transmission between vectors, humans, and animals.

Key references include (Further references can be found in the Project Narrative):

Anyamba A, *et al.* Prediction, Assessment of the Rift Valley Fever Activity in East and Southern Africa 2006-2008 and Possible Vector Control Strategies. Am J Trop Med Hyg. 2010;83(2):43-51.

Kasari TR, *et al*. Evaluation of pathways for release of Rift Valley fever virus into domestic ruminant livestock, ruminant wildlife, and human populations in the continental United States. JAVMA. 2008; 232(4):514-529.

Archer BN, *et al*. Outbreak of Rift Valley fever affecting veterinarians and farmers in South Africa, 2008. S Afr Med J. 2011;101(4):263-6.

The RSA represents an ideal location for this research given the weaknesses in current understanding of RFV epidemiology there, the willingness, interest and capacity of local partners to engage in the project, the impact of RVF outbreaks to agricultural production and risks to people and trade, the abundance of wildlife and presence of game farming to facilitate the research activities needed, and the recertification of the NICD BSL-4 laboratory facilities. The study area has seen multiple RVF outbreaks in the past and hosts a variety of ruminant species – including domestic cattle, goats and sheep as well as wildlife. It hosts 23% of the game farming in RSA. Preliminary data has been obtained for this project through field studies and testing with project partners EcoHealth Alliance, SANParks, DETEA and NICD (Technical Proposal Table 1). The preliminary data has informed the study design by allowing us to target wild ruminant species with highest seroprevalence for RVFV. Furthermore, the success of collaboration with project partners to date ensures the ability to collect adequate samples for analytical statistical significance and the ability to conduct testing of samples in RSA.

Tasks/Scientific Goals: **(Format: Year #(s).Task #.Sub-task#)**

Task Y1.1-OY5.1: Improve the capacity for South Africa to be a leader in vector-borne diseases and Rift Valley fever virus epidemiology (Years 1-OY5).

Our team believes that South Africa can be a leader and model to other African nations regarding public health. Three medical entomology and mosquito identification workshops for regional professionals will be given. This will focus on techniques for trapping adult mosquitoes and larvae and their identification. A post-doctoral fellow from South Africa or southern Africa will split her/his time between EHA (conducting epidemiological and ecological analyses) and working in South Africa (working with the field and laboratory teams). We will also select two Masters' students in epidemiology and one or two (if option years are approved) Masters' students in entomology from the University of Pretoria.

Y1.1.1, Y3.1.1, OY4.1.1 Conduct an entomology workshop for participants from southern Africa.

Y1.1.2-OY5.1.2 Mentor a South African post-doctoral fellow on RVFV epidemiology.

Y1.1.3 -Y2.1.3 Train two Masters' students in epidemiology.

Y1.1.4-OY4.1.4 Train PhD student.

Y2.1.5-OY4.1.5 Train Masters' student(s) in medical entomology.

Task Y1.2-OY5.2: Field mosquito studies and corresponding satellite data (Years 1-OY5).

The grantees shall **1)** monitor rainfall conditions on a daily basis. Additionally, the vegetation conditions using normalized difference vegetation index (NDVI) shall be monitored via satellite every 10 days in our 20,000Km^2 study area; **2)** Identify the mechanistic link between mosquito abundance and succession in RSA with NDVI satellite data technology by conducting a line transect with 40km intervals, with weekly vegetation transects and daily larvae sampling of flooded *dambos* in Y1; **3)** Use a variety of traps to collect mosquitoes at selected sites for one week per site per quarter and after identification, screen pools with RT-PCR and isolate RVFV viral strains, and isolate blood-meals to analyze using PCR of the vertebrate cytochrome b gene of mitochondrial DNA (RNA extraction will occur in a BSL-3 or more secure facility; PCR and RT-PCR will be conducted in a BSL-2 facility). **4)** Grantee shall conduct mosquito abundance and diversity sampling at the 50 ranches randomly chosen from the metapopulation investigation (see Task 6) during Y3 and OY5.

Y1.2.1 Finalize proposed protocols with collaborators and stakeholders in RSA.

Y1.2.2 Implement concurrent vegetation and dambo transects for mosquito larvae.

Y1.2.3-OY5.2.3 Collect and process mosquitoes at ruminant sampling sites.

Y1.2.4-OY5.2.3 Collect satellite derived rainfall, temperature and NDVI data.

Y3.2.5, OY5.2.5 Conduct cross-sectional mosquito study across the 20,000km^2 study site.

Task Y1.3-OY5.3: Ruminant immunological study (Years 1-OY5).

Our target ruminant community for sampling includes domestic livestock, game-ranched wildlife and free-ranging wildlife. The importance of each group and each scale will be analyzed based on the data from Task 3 and Task 5 (below). **1) Sheep flocks – Individual immunity:** We will create experimental flocks of 70 modified-live vaccinated, 70 inactivated vaccinated and 70 non-vaccinated seronegative sheep. Sheep will be maintained in the same manner as domestic stock on farms in Free State. The flocks will be sampled quarterly and tested for anti-RVFV IgG, IgM and interferon gamma (BSL-2). Each treatment group should give us different information regarding the longevity of anti-RVFV antibodies and innate immunity. Aliquots will remain in cryogenic storage at the state veterinary laboratories. **2) Game-Farm springbok – Population immunity:** We will work with commercial game ranches that raised springbok for hunting or meat. We will simulate RVFV exposure by using a modified-live vaccinated group to compare to a control group. In Y1 the 800 springbok will be captured, vaccinated (if needed), sampled, tagged, quarantined and released. Annually, 100 vaccinated and 100 unvaccinated springbok will be culled as part of the ranches' protocol. All sera will be tested by virus neutralization test (BSL-3). Unused serum aliquots will be stored in a secure serum bank at SANParks.

Y1.3.1 Vaccinate sheep for individual and population level immunoepidemiolgical studies.

Y1.3.2-OY5.3.2 Collect quarterly/annual serology in study flocks and/or herds.

Y1.3.3 Vaccinate springbok for individual and population level immunoepidemiolgical studies.

Task Y1.4, Y2.4, Y4.4: Disseminate reports to relevant stakeholders (Years 1, 2, 4).

Synthesize all data collected through the projects described above as well as capacity building activities in South Africa. A database for the extensive amount of data shall be developed and used for epidemiological analyses. Biobank sample repositories will be maintained and corresponding metadata will be available. Scientific and general reports will be generated. A stakeholder meeting will be held annually (Tasks 4 and 7- see Task 7 for Y3 and OY5, for more complete summaries to close the project) to describe the project and the current results.

Y1.4.1, Y2.4.1, OY4.4.1 Submit reports, including sample repository data, to DTRA.

Y1.4.1, Y2.4.1, OY4.4.1 Complete annual report to local stakeholders.

Y1.4.3 Disseminate preliminary serological data in a peer-reviewed publication..

Y1.4.1, Y2.4.1, OY4.4.1 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Y1.4.1, Y2.4.1, OY4.4.1 Submit and maintain samples in biobanks.

Y1.4.1, Y2.4.1, OY4.4.1 Conduct annual stakeholder meetings.

Y2.4.7, OY4.4.7 Prepare to submit publications on data collected in Years 1-4.

Task Y.2.5-OY5.5: Conduct human surveys and serological cross-sectional study (Years 2-OY5).

Grantee shall develop and publish public health information on the prevention of RVFV and vector-borne diseases for the ranchers and employees in the Free State. The information will be

published in English, Afrikaans and Sestho. Grantee shall conduct annual serosurveys and written surveys of the employees (on a voluntary basis) at the ranches where the study sheep and springbok flocks/herds are located to detect possible inter-epidemic human transmission of RVFV. During the meta-population analyses a large cross-sectional study across the ranches and farms throughout our 20,000km^2 study site shall be conducted. Human serum samples shall be screened by ELISA (IgG and IgM; BSL-2) and confirmed with virus neutralization (BSL-3).

Y2.5.1 Develop written information booklet on RVFV and other vector-borne diseases.

Y2.5.2 Develop written questionnaire for risk analyses of RVFV infection.

Y2.5.3-OY5.5.3 Collect serology samples from people at the ranches in domestic and game-farm study.

Y2.5.4-OY5.5.4 Conduct written questionnaire in conjunction with blood collection.

Y2.5.5-OY5.5.5 Conduct serological analyses for human anti-RVFV IgG and IgM.

Y3.5.6, OY5.5.6 Conduct serology and written surveys for people at farms used for metapopulation study.

Task Y3.6, OY5.6: Ruminant metapopulation study (Years 3 and O5).

Grantee shall conduct a large-scale serosurvey of free-ranging and farmed wildlife and livestock herds. We propose two replicate sampling events following each rainy season in Years 3 and OY5. For six species (sheep, goats, cattle, springbok, kudu and blesbok) grantee shall sample a minimum of 400 individuals (the wild species will include samples from game ranches and Mokala National Park). A minimum of 50 individuals from three additional species (buffalo, waterbuck and kudu) and 100 nyala will be sampled. Laboratory tests include ELISA IgG and IgM (BSL-3) and VNT for wildlife (BSL-3). Data on animal movement, including birth and cull rates for ranched animals as well as trade shall be obtained by the ranch owner via a survey.

Y3.6.1, OY5.6.1 Conduct metapopulation level herd immunity survey of domestic and wild ruminants.

Y3.6.2, OY5.6.2 Store wildlife serum in SANParks biobank for future studies.

Task Y3.7, OY5.7: Epidemiological analyses and comprehensive report of project to date (Years 3 and OY5).

Grantee shall prepare the database and complete analyses on mosquito, satellite and ruminant data collected from the project to date, including metapopulation data. Grantee shall synthesize this data and prepare manuscripts for publication. A stakeholder meeting will be held annually to describe the project and the current results.

Y3.7.1, OY5.7.1 Analyze and disseminate mosquito data.

Y3.7.2, OY5.7.2 Analyze and disseminate ruminant data.

Y3.7.3, OY5.7.3 Analyze and disseminate human data.

Y3.7.4, OY5.7.4 Synthesize and report project's scientific and capacity building success to DTRA.

Y3.7.5, OY5.7.5 Prepare and submit manuscripts for publication in peer-reviewed journals.

Y3.7.6, OY5.7.6 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Task	Year 1	Year 2	Year 3	Year O4	Year O5
Task 1: Improve the capacity for South Africa to be a leader in vector-borne diseases and RVFV epidemiology					
[redacted]					
1.2 Mentor a South African post-doctoral fellow on RVFV epidemiology					
1.3 and 1.5 Train Masters' students	Epidemiology	Epidemiology and Entomology	Entomology		
1.4 Train PhD student					
Task 2: Field mosquito studies and corresponding satellite data.					
[redacted]					
2.2 Concurrent vegetation and mosquito larvae transects					
2.3 Collect and process mosquitoes at ruminant sampling sites					
2.4 Collect satellite weather and NDVI data					
2.5 Cross-sectional mosquito study					
Task 3: Ruminant immunological study					
3.1 Vaccinate sheep					
3.2 Collect quarterly/annual serology in study flocks and/or herds					
3.3 Vaccinate springbok					
Task 4: Disseminate reports to relevant stakeholders					
[redacted]					
4.2 Complete annual report to local stakeholders					
4.3 Disseminate serological data in a peer-reviewed publication					
4.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review	ASTMH, IMED, or other	ASTMH, IMED, or other		ASTMH, IMED, or other	
4.5 Submit and maintain samples in biobanks					
4.6 Conduct annual stakeholder meetings					
4.7 Prepare to submit publications					
Task 5: Conduct human surveys and cross sectional serological study					
5.1 Develop booklet on RVFV and other VBDs					
5.2 Develop written questionnaire - risk analyses					
5.3 Serology from people at the ranches					
5.4 Conduct written questionnaire		Survey of ranches		Survey of ranches	
5.5 Serological analyses: IgG and IgM					
5.6 Metapopulation serology & written surveys			Cross-sectional		Cross-sectional
Task 6: Ruminant metapopulation study					
6.1 Metapopulation level herd immunity survey of ruminants					
6.2 Store wildlife serum at SANPark biobank					
[redacted]					
7.1 Analyze and disseminate mosquito data					
7.2 Analyze and disseminate ruminant data					
7.3 Analyze and disseminate human data					
7.4 Report project's scientific and capacity building success to DTRA					
7.5 Prepare and submit manuscripts for peer-reviewed publications					
7.6 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review			ASTMH, IMED etc		ASTMH, IMED etc

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	N/A	N/A	N/A	Government
000101	N/A	N/A	N/A	Government
0002	N/A	N/A	N/A	Government
0003	N/A	N/A	N/A	Government
0004	N/A	N/A	N/A	Government
0005	N/A	N/A	N/A	Government

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 28-MAY-2014 TO 27-MAY-2015	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
0002	POP 28-MAY-2015 TO 27-MAY-2016	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
0003	POP 28-MAY-2016 TO 27-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1
0004	POP 28-MAY-2017 TO 27-MAY-2018	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1
0005	POP 28-MAY-2018 TO 27-MAY-2019	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20142016 D 34HQ 0901515BR-KD-BP 1416-0134-34HQ-SOUCT DTRA 410
AMOUNT: $992,699.00
CIN CTB12254000101: $992,699.00

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/BE-BCR
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. Grantee Business Office:
Name: Mr. Aleksei Chmure
Title: Chief of Staff.
Phone: 212-380-4473
E-mail: chmure@ecohealthalliance.org.

c. Grantee Principal Investigator (PI):
Name: Dr. William B Karesh.
Title: Principal Investigator.
Phone: 212-380-4463.
E-mail: Karesh@ecohealthalliance.org.

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/J3CTBS
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

e. This grant is awarded as a result of Broad Agency Announcement (BAA) HDTRA1-09-14-FRCWMD-BAA, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

f. **CFDA #:** 12.351

g. **Authority:** Pub. 11376 Cooperative Threat Reduction.

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit _	Terms and Conditions		

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 | 4

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00002	01-Jun-2015		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON BOSTON REGIONAL OFFICE, 495 SUMMER STREET, RO BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended. ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
IAW Grant Terms and Conditions Section 10(b)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: levacg151548

The prupose of this modification is to:

1. Exercise and fully fund the option at CLIN 0002, in the amount of 978,784.00, and
2. Update clause 252.601-9000 "Grant Points of Contact"

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 01-Jun-2015

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $978,784.00 from $992,699.00 to $1,971,483.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0002
The option status has changed from Option to Option Exercised.

SUBCLIN 000201 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000201					$0.00
	Funding Information Only FFP Funding for Option Year 1 FOB: Destination				
				NET AMT	$0.00
	ACRN AB CIN: HDTRA1516990000201				$978,784.00

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000201:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $978,784.00 from $992,699.00 to $1,971,483.00.

SUBCLIN 000201:
Funding on SUBCLIN 000201 is initiated as follows:

ACRN: AB

CIN: HDTRA1516990000201

Acctng Data: 044315 097 0134 000 N 20152017 D 34HQ 0901515BR_KD_BP_OT 1517_0134_34HQ_SOUCT DTRA 410

Increase: $978,784.00

Total: $978,784.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4COC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. Grantee Business Office:
Name: Mr. Aleksei Chmure
Title: Chief of Staff.
Phone: 212-380-4473
E-mail: chmure@ecohealthalliance.org.

c. Grantee Principal Investigator (PI):
Name: Dr. William B Karesh.
Title: Principal Investigator.
Phone: 212-380-4463.
E-mail: Karesh@ecohealthalliance.org.

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/J3CTBS
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 | 4

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00003	17-May-2016		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4CO 8725 JOHN J. KINGMAN RD. FT. BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
Terms and Conditions Section 6.

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: allenc1671

This reason for this modification is:
1. To update the Grant Administraiton POC for EcoHealth
2. To update the Statment of Work, dated March 10, 2016.
3. To add funding for year 3 in the amount of $970,536.00 to subCLIN 000301, ACRN AC.

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTS OFCR/GRANTS OFCR TEL (b)(6) EMAIL (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 17-May-2016

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000301 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000301					$0.00
	Funding Information Only FFP CTB-16-203 FY16 EcoHealth Year 3 Rift Valley Fever in South Africa Incremental FOB: Destination				
				NET AMT	$0.00
	ACRN AC CIN: CBEP00016990000301				$970,536.00

SECTION C - DESCRIPTIONS AND SPECIFICATIONS

The following have been deleted:
STATEMENT OF WORK

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000301:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $970,536.00 from $1,971,483.00 to $2,942,019.00.

SUBCLIN 000301:
Funding on SUBCLIN 000301 is initiated as follows:

ACRN: AC

CIN: CBEP00016990000301

Acctng Data: 044315 097 0134 000 N 20162018 D 34HQ 0901515BR_KD_BP_OT 1618_0134_34HQ_AFRCT DTRA 410

Increase: $970,536.00

Total: $970,536.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4COC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. Grantee Business Office:
Name: Ms. Virgina Porter
Title: Administrative Assistant to the Executive Vice President for Health &Policy_
Phone: 212.380.4470 _
E-mail: Porter@EcoHealthAlliance.org .

c. Grantee Principal Investigator (PI):
Name: Dr. William B Karesh.
Title: Principal Investigator.
Phone: 212-380-4463.
E-mail: Karesh@ecohealthalliance.org.

SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

The Table of Contents has changed from:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit _	Terms and Conditions		

to:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	Terms and Conditions		
Attachment 2	Statement of Work (SOW)		10-MAR-2016

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 4

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00004	19-May-2017		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
	X	10B. DATED (SEE ITEM 13) 28-May-2014
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended. ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
DTRA Terms and Conditions

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not. ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: fountain171682
RQN: HDTRA15169990

The purpose of this modification is to provide funding in the amount of $996,147 to subCLIN 000401, ACRN AD.

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
		(b)(6) CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6)
(Signature of person authorized to sign)		(Signature of Contracting Officer)
		16C. DATE SIGNED 22-May-2017

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $996,147.00 from $1,971,483.00 to $2,967,630.00.
The standard size code 1,000 has been added.
The NAICS code 541711 has been added.

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000101
The unit of issue Lot has been deleted.
The FOB Destination has been deleted.

SUBCLIN 000201
The FOB Destination has been deleted.

SUBCLIN 000301
The FOB Destination has been deleted.

CLIN 0004
The option status has changed from Option to Option Exercised.

SUBCLIN 000401 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000401					$0.00
	Funding in support of Option Yr 3 FFP				
				NET AMT	$0.00
	ACRN AD CIN: J3CTB16990000401				$996,147.00

SECTION E - INSPECTION AND ACCEPTANCE

The Acceptance/Inspection Schedule for SUBCLIN 000101 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for SUBCLIN 000201 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The Acceptance/Inspection Schedule for SUBCLIN 000301 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

The following Acceptance/Inspection Schedule was added for SUBCLIN 000401:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0005 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 28-MAY-2018 TO 27-MAY-2019	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 28-MAY-2018 TO 27-MAY-2019	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $996,147.00 from $2,942,019.00 to $3,938,166.00.

SUBCLIN 000401:
Funding on SUBCLIN 000401 is initiated as follows:

ACRN: AD

CIN: J3CTB16990000401

Acctng Data: 044315 097 0134 000 N 20172019 D 34HQ 0901515BR_KD_BP2_OT 1719_0134_34HQ_SCNCT DTRA 410

Increase: $996,147.00

Total: $996,147.00

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00005	10-Jul-2017		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended. ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

X B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not. ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: fountain172062
RQN:16990A

The purpose of this administrative modification is to:

1.) Make corrections to Mod P00003 by Exercising Option CLIN 0003.
2.) Add Grant Funding Profile clause, 252.632-9000.

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 11-Jul-2017

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $970,536.00 from $2,967,630.00 to $3,938,166.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0003
The option status has changed from Option to Option Exercised.

SECTION G - CONTRACT ADMINISTRATION DATA

The following have been added by full text:

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:
The amount of $3,938,166 is obligated for work to be performed during the period beginning with grant award and continuing through May 27, 2018. Additional incremental funding planned, but not obligated, is:

The Government's liability is limited to the amount obligated

INVOICE SCHEDULE:		
INVOICE NO.	INVOICE DATE	PAYMENT
37	06/30/2017	$83,012.25
38	07/30/2017	$83,012.25
39	08/30/2017	$83,012.25
40	09/30/2017	$83,012.25
41	10/30/2017	$83,012.25
42	11/30/2017	$83,012.25
43	12/30/2017	$83,012.25
44	01/30/2018	$83,012.25
45	02/28/2018	$83,012.25
46	03/30/2018	$83,012.25
47	04/30/2018	$83,012.25
48	05/30/2018	$83,012.25

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00006	25-May-2018		

6. ISSUED BY CODE HDTRA1

DEFENSE THREAT REDUCTION AGENCY/AL-ACO
8725 JOHN J.KINGMAN RD
FT BELVOIR VA 22060-6201

7. ADMINISTERED BY (If other than item 6) CODE N62879

OFFICE OF NAVAL RESEARCH-BOSTON
495 SUMMER STREET, ROOM 627
BOSTON MA 02110-2109

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

ECOHEALTH ALLIANCE INC.
MR. ALEKSEI CHMURA
460 W 34TH ST 17TH FL
NEW YORK NY 10001-2317

CODE 3MMU3 FACILITY CODE

	9A. AMENDMENT OF SOLICITATION NO.
	9B. DATED (SEE ITEM 11)
X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14. PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
DTRA Terms and Conditions

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not. ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: rodgrigt18860

RQN: HDTRA1516990 Amend No 4

The purpose of this modification is to:

1. Exercise option year 4 on CLIN 0005.
2. Provide funding in the amount of $998,193.00 on subCLIN 000501.
3. Updated the Grant Points-of-Contact, Grant Officer's Representative, and invoice schedule.
4. Update the Terms and Conditions.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
	(b)(6) CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	25-May-2018

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $998,193.00 from $3,938,166.00 to $4,936,359.00.
The 'issued by' organization has changed from
DEFENSE THREAT REDUCTION AGENCY/J4C
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201
to
DEFENSE THREAT REDUCTION AGENCY/AL-ACO
8725 JOHN J.KINGMAN RD
FT BELVOIR VA 22060-6201

The 'administered by' organization has changed from
OFFICE OF NAVAL RESEARCH-BOSTON
BOSTON REGIONAL OFFICE, 495 SUMMER STREET, RO
BOSTON MA 02110-2109
to
OFFICE OF NAVAL RESEARCH-BOSTON
495 SUMMER STREET, ROOM 627
BOSTON MA 02110-2109

The 'Payment will be made by' organization has changed from
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182266
COLUMBUS OH 43218-2266
to
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182317
COLUMBUS OH 43218-2317

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0005
The option status has changed from Option to Option Exercised.

SUBCLIN 000501 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000501					$0.00
	Funding in support of OY 4, CLIN 0005 FFP				
				NET AMT	$0.00
	ACRN AE CIN: HDTRA151699004000501				$998,193.00

SECTION E - INSPECTION AND ACCEPTANCE

The Acceptance/Inspection Schedule for CLIN 0005 has been changed from:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

To:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
Destination	Government	Destination	Government

The following Acceptance/Inspection Schedule was added for SUBCLIN 000501:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $998,193.00 from $3,938,166.00 to $4,936,359.00.

SUBCLIN 000501:
Funding on SUBCLIN 000501 is initiated as follows:

ACRN: AE

CIN: HDTRA151699004000501

Acctng Data: 044315 097 0134 000 N 20182020 D 34HQ 0901515BR KD BP OT 18 1820 0134 34HQ SCNCT DTRA 410

Increase: $998,193.00

Total: $998,193.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/AL-ACO
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. Grantee Business Office:
Name: Ms. Virgina Porter
Title: Administrative Assistant to the Executive Vice President for Health &Policy.
Phone: 212.380.4470 _
E-mail: Porter@EcoHealthAlliance.org .

c. Grantee Principal Investigator (PI):
Name: Dr. William B Karesh.
Title: Principal Investigator.
Phone: 212-380-4463.
E-mail: Karesh@ecohealthalliance.org.

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/J3CTBS_
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:
The amount of $4,936,359.00 is obligated for work to be performed during the period beginning with grant award and continuing through May 27, 2019. Additional incremental funding planned, but not obligated, is:

The Government's liability is limited to the amount obligated

INVOICE SCHEDULE:		
INVOICE NO.	INVOICE DATE	PAYMENT
49	06/30/2018	$83,182.75
50	07/30/2018	$83,182.75
51	08/30/2018	$83,182.75
52	09/30/2018	$83,182.75
53	10/30/2018	$83,182.75
54	11/30/2018	$83,182.75

55	12/30/2018	$83,182.75
56	01/30/2019	$83,182.75
57	02/28/2019	$83,182.75
58	03/30/2019	$83,182.75
59	04/30/2019	$83,182.75
50	05/30/2019	$83,182.75

SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

The Table of Contents has changed from:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	Terms and Conditions		
Attachment 2	Statement of Work (SOW)		10-MAR-2016

to:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work (SOW)		10-MAR-2016
Exhibit B	DTRA Terms and Conditions		06-APR-2018

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES	
J	1	2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00001	20-Aug-2014		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4CB 8725 JOHN J. KINGMAN ROAD FT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON BOSTON REGIONAL OFFICE, 495 SUMMER STREET BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
X	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: croninr141895

The purpose of this administrative modification is to:
1. Add the Office of Naval Research as the contract administrator as shown in block #7.

These changes are at no additinoal cost to the Government. All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 20-Aug-2014

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The 'administered by' organization has changed from

DEFENSE THREAT REDUCTION AGENCY/J4C
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201

to

OFFICE OF NAVAL RESEARCH-BOSTON
BOSTON REGIONAL OFFICE, 495 SUMMER STREET
BOSTON MA 02110-2109

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00007	01-Sep-2020		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA1-14-1-0029
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 28-May-2014

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER (Specify type of modification and authority) DTRA Terms and Conditons, Section 5

E. IMPORTANT: Contractor [X] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: lyles201770

The purpose of this modification is to:

1) Deobligate FY18 funds

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
		(b)(6) CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)
		16C. DATE SIGNED 01-Sep-2020

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0001
The PSC code U009 has been added.

CLIN 0002
The PSC code U009 has been added.

CLIN 0003
The PSC code U009 has been added.

CLIN 0004
The PSC code U009 has been added.

CLIN 0005
The PSC code U009 has been added.

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was decreased by $36.61 from $4,936,359.00 to $4,936,322.39.

SUBCLIN 000501:

AE: 044315 097 0134 000 N 20182020 D 34HQ 0901515BR KD BP OT 18 1820 0134 34HQ SCNCT DTRA 410 (CIN HDTRA151699004000501) was decreased by $36.61 from $998,193.00 to $998,156.39

(End of Summary of Changes)

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	4,936,359.00
b. Total Non-Federal Funds	1,006,940.00
c. Total Federal & Non-Federal Funds	5,943,299.00
d. Estimated Program Income	0.00

16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:

DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR

☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalities. (U.S. Code, Title 18, Section 1001)

☐ *** I agree**

** The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL or other Explanatory Documentation

Add Attachment | Delete Attachment | View Attachment

19. Authorized Representative

Prefix: Mr. * First Name: Aleksei Middle Name:

* Last Name: Chmura Suffix:

* Position/Title: Chief of Staff

* Organization: EcoHealth Alliance

Department: Division:

* Street1: 460 West 34th St, 17th Floor

Street2:

* City: New York County / Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * ZIP / Postal Code: 10001-2320

* Phone Number: 212-380-4473 Fax Number: 212-380-4465

* Email: chmura@ecohealthalliance.org

*** Signature of Authorized Representative**

Completed on submission to Grants.gov

*** Date Signed**

Completed on submission to Grants.gov

20. Pre-application

Add Attachment | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 06/30/2011

*** ORGANIZATIONAL DUNS:** 0770900660000 **Enter name of Organization:** EcoHealth Alliance

*** Budget Type:** ☒ Project ☐ Subaward/Consortium **Budget Period: 1** *** Start Date:** 11/01/2013 *** End Date:** 10/31/2014 Delete Period

A. Senior/Key Person

	Prefix	* First	Middle	* Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
X	Dr.	William		Karesh		242,035.00	3.00			40,338.00	13,029.00	53,367.00
	* Project Role: PI											
X	Dr.	Melinda		Rostal		71,400.00	8.00			47,600.00	15,375.00	62,975.00
	* Project Role: Co PI											
X	Dr.	Parviez		Hosseini		67,964.00	1.10			6,230.00	2,012.00	8,242.00
	* Project Role: Key Personnel											
X	Dr.	Peter		Daszak		273,500.00	2.00			11,396.00	3,681.00	15,077.00
	* Project Role: Key Personnel											

Add Additional Key Person

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 139,661.00

B. Other Personnel

	* Number of Personnel	* Project Role	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	1	Post Doctoral Associates	12.00			40,000.00	12,920.00	52,920.00
		Graduate Students						
		Undergraduate Students						
		Secretarial/Clerical						
X	1	Program Administrator	2.00			8,636.00	2,790.00	11,426.00
X	1	Project Veterinarian	12.00			30,000.00	0.00	30,000.00
X	1	Veterinary Technician	12.00			18,000.00	0.00	18,000.00
X	1	Botanist Technician	6.00			9,000.00	0.00	9,000.00
X	2	Student Technician	12.00			26,000.00	0.00	26,000.00
X	10	Springbok Capture Team	1.00			26,960.00	0.00	26,960.00

Add Additional Other Personnel

17 **Total Number Other Personnel**

Total Other Personnel 174,306.00

Total Salary, Wages and Fringe Benefits (A+B) 313,967.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
X	Vehicle	80,000.00
X	ELISA Reader	6,000.00

Add Additional Equipment

Additional Equipment: Add Attachment Delete Attachment View Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 86,000.00

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	1,960.00
2.	Foreign Travel Costs	21,791.00
	Total Travel Cost	23,751.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	90,253.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	230,017.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	320,270.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	743,988.00

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
X	BBA Overhead	44.10	513,970.00	226,661.00
X	Indirect on Subcontracts	44.10	230,017.00	22,050.00

Add Additional Indirect Cost

	Funds Requested ($)
Total Indirect Costs	248,711.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	992,699.00

J. Fee

Funds Requested ($)

K. * Budget Justification

(Only attach one file.) BBA Y1 CY5_DTRA CBEP RVFV Budget 9 18

Add Attachment | Delete Attachment | View Attachment

EcoHealth Alliance (EHA): Y1

PI Salary. PI Karesh will commit .5 month p.a. (Y1-OY5). In Year 1 we will request .2 month's salary ($30,338) and will match the rest of the salary with non-governmental funding. PI Karesh will meet with PIs and Key Personnel in South Africa to initiate the project (he will meet them either in Johannesburg or in Kimberly). He will work with Co-PI Rostal to coordinate the wide array of partners involved in this collaboration. He will oversee the start of the ruminant and mosquito field work with Co-PI Rostal. He will mentor the post-doctoral fellow during his/her time in NYC. PI Karesh will attend the DTRA Annual Technical Review. Co-PI Rostal will commit 8-mo p.a. (Y1-OY5) to the project. In Y1 we will request .5 month's salary ($47,000). She will work with PI Karesh to coordinate the many partners involved in this collaboration. She will work with our South African colleagues to ensure all the proper permits IACUC/IRB equivalents are submitted and accepted. She will also develop the U.S.-based IACUC and IRB. She will make two trips to South Africa, one with PI Karesh to meet with the collaborators and local stakeholders and assist with initial sampling and one to assist with sampling later in the year. She will work closely with the local project veterinarian and Key Personnel on the various parts of the project. She will mentor the post-doctoral fellow in epidemiology during his/her time in NYC. She will also lead the team in authoring the peer-reviewed publication describing the preliminary data.

Other Personnel. Key Personnel (KP) Hosseini will commit 1.1-3 month p.a. (Y1-OY5) to this project. In Year 1 we will request 1.1 month's salary ($7,230). KP Hosseini will meet with collaborators in South Africa to finalize the field protocols. KP Hosseini will develop the database to store all field, laboratory and repository data. KP Hosseini will mentor the post-doctoral fellow in the ecology of diseases during his/her time in NYC. Key Personnel Daszak will commit 2 months p.a. (Y1-OY5) to the project. We will request $12,296 in Y1 (.5 months), and his remaining (1.5 months) time will be funded through non-governmental sources. He will oversee the overall sampling protocol finalization and mentor the post-doctoral fellow in the study of infectious diseases. We will have a program administrator committed to 2 months p.a. (Y1-OY5), which is $8,036 in Y1. The program administrator will assist with communication among the collaborators, the hiring of the RSA project veterinarian, technicians and capture team and the logistics of travel for the PIs, KPs and the fellow. We will support a full-time post-doctoral fellow in epidemiology and infectious diseases, and as he/she will be spending varying amounts of time in the U.S. we will be offering a competitive salary (starting at $40,000) for 12 months p.a. (Y1-OY5). The post-doctoral fellow will be selected from one of the following candidate pools, listed by priority, South Africa, southern Africa, and Africa, depending on interest in the position. The selected fellow will be responsible, on an annual basis, for collecting the mosquitoes from the locations of our sheep flocks and springbok herds and in Mokala National Park (MNP). He/she will also help the veterinarian with ruminant sampling and testing. He/she will attend the entomology workshop and make one or two visits to EHA p.a. to work with the NYC collaborators and train in the epidemiology and ecology of infectious diseases. In Y1 he/she will also spend one month with KP Anyamba, learning about the use of normalized difference vegetation indices (NDVI) and satellite data analyses. We will hire a local veterinarian as the project veterinarian for 12 months (starting at $30,000) p.a. (Y1-O5). The project veterinarian will work closely with KP Nel, PI Rostal, KP Kemp and the post-doctoral fellow to coordinate all ruminant sampling and testing. The project veterinarian will join the stakeholder

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meeting and will work with KP Nel to establish the experimental sheep flocks. He/she will be responsible for quarterly sampling of the sheep and testing the whole blood for innate immune response (γINF), in coordination with NICD. A technician will be hired for 12 months ($18,000) p.a. (Y1-OY5). The technician will assist the veterinarian with all ruminant sampling, innate immune response analysis and delivering the serum samples to NICD for, RVFV serology analysis. The technician will also assist with the mosquito sampling at ruminant locations when the post-doctoral candidate is in the U.S. A botanist technician will be hired for 6 months in Y1 ($9,000). The technician will be responsible for conducting the vegetation and dambo transects in Y1 to validate the NDVI analyses. The technician will submit all data to EHA to be stored in the database and ensure proper care of the larvae until they are submitted to KP Kemp at NICD. We will hire 1 to 3 student technicians full time during Y1-OY1. These technicians will assist in sample collection as well as laboratory analysis, in addition to this they will conduct a small research project as described in the technical report and the statement of work. We have budgeted $3,000 p.a. for each student. In Y1 we will hire two students, for a total of $6,000. Initial capture, sampling, tagging and vaccinating of springbok (or injecting them with saline as placebo) will require the assistance of a 10 man capture team for one month in Y1 ($2,696 per man per month = $26,960).

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Fringe Benefits. Fringe benefits are calculated as 32.3% of base salary for PIs, KPs, the program administrator and the post-doctoral fellow (they increase by 0.5% annually).

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Equipment. We will purchase a vehicle in Y1 ($30,000) that will be used for ruminant, human and mosquito sampling (Y1-OY5). A vehicle will be required as, renting a 4x4 wheel drive vehicle is approximately $150 per day. This cost would quickly overpass the requested amount for the vehicle. At times when more than one team is in the field (ruminant team, mosquito team or human team) we will need a second vehicle. As part of cost-sharing the DOD-RSA have agreed to provide a vehicle when needed as per the memorandum of understanding that will be completed during Y1. These vehicles are necessary given the geographic variation of our sites especially in Y1, Y3 and OY5 (our study site is 200Km^2) of the project as well as the variety of sampling types that will occur. We will purchase an ELISA reader ($6,000) for sheep γINF ELISAs.

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Travel.

International All flights to/from South Africa from/to New York City were calculated at $2000 RT airfare to/from Johannesburg, $2200 round-trip airfare to/from Kimberley and $400 for flights from Johannesburg to Kimberley. Room and board for Johannesburg is $175 a day and $40 in Kimberley.

PI Karesh will visit the lab and the field site once in Y1-3 and OY5 ($2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*6 days) + 67 misc. travel costs = $3,057). Co-PI Rostal will make two trips per year to the field site to oversee sampling (Trip 1: $2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*40 days) + 67 misc. travel costs $4,417; Trip 2: $2200 airfare + ($40*14 days) = 100 misc. travel costs = $2,860). KP Hosseini will visit the field site in Y1. He will travel with PI Karesh, visiting Johannesburg for 2 days and Kimberley for 6 days ($2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*6 days) + 67 misc. travel costs = $3,057). The post-doctoral fellow will make two trips to the U.S.

for a total of 5-6 months. The salary provides compensation for living expenses in the U.S., thus only funding for the flights will be requested ($2,200*2 trips = $4,400).
U.S. Domestic: We are also budgeting $550 p.a. for KP Hosseini to meet with KP Anyamba at USRA ($550 – 150 train fare + $300 hotel + $100 for local transit). In Y1 the post-doctoral fellow will spend 1 month in Baltimore, and as stated above, transportation will be funded ($150 train fare). In Y1 we are budgeting $1,260 for PI Karesh to attend the DTRA Annual Technical Review ($500 airfare · $120 hotel * 3 nights + $100 food * 3days + $100 for transit).
RSA Domestic: While the veterinarian, technician and post-doctoral candidate will be using the purchased vehicle, the transportation for the botanist technician (est. @ $14,560: for a car and driver $112/day * 130 days) will be provided as part of cost-sharing from DoD RSA as per the memorandum of understanding. We will pay for fuel for our vehicle at $0.101/km * 150km per day * 262 days = $4,000 p.a.

Other Direct Costs.
Materials and Supplies Funds for ruminant sampling in Y1 we have budgeted $18,531 in flock start-up costs. Flock costs will vary by vaccine status (one sheep is $64.30, control flock is $64.3*70 = $4,501; inactivated costs $8.25 more per individual, $72.55*70 ≈ $5,078 and modified-live vaccinated is $29.30 more per individual, $93.60*70 – $6,552). Farmers will be paid $800 per flock p.a. to maintain the flocks. For sampling, the market rate is SAR25/kg of meat. 18kg per animal costing $9,000 for each of two 400 animal herd. 8 ranches will participate (– with vaccinated animals and – without) and 2 ranches will be culled per year. We budgeted $2000 p.a. to divide among the farms, as the farms in Y3-5 would normally have already culled their animals and need greater incentive the longer they keep the animals. Gamma-interferon kits are $425 each and test 46 animals in duplicate p.a. We will use 20 kits ($425*20 – $8,500) p.a. A cell incubator for the γINF is $1000, in the lab where the innate immunity testing will occur. We expect to spend $5,000 p.a. to purchase sampling materials, such as nitrile gloves, vaccutainer® tubes and needles, dry ice, netting for bomas, respirators for separating serum in the field, two portable centrifuges, and ear tags etc. Additionally, the team will require a GPS unit ($400).

Mosquito trapping supplies are estimated to cost a total of $6,972 in Y1, including *Aedes* specific mosquito traps (e.g. 8 BioSentinel Mosquito traps, 8 oviposition traps and 6 CDC light traps - $200 ea. – $1,800), 5 Shannon CO_2 traps ($194ea. – $970) and two Modified CDC Backpack Aspirator with Regular/fine Mesh Stainless Steel Collection Cups ($601 ea. = $1,202).

We have budgeted $6,000 for additional supplies for the Masters' student's project ($3,000 per student), as he/she may incorporate other factors or pathogens into his/her research.

We are budgeting $1,500 p.a. to host a stakeholders' meeting in the Free State. This will include local ranchers, farmers, veterinarians, and policy makers. We will introduce the project to them and find potential participant farms/ranches for our experimental flocks/herds.

We budgeted $3000 to purchase a computer for the post-doctoral fellow in Y2 for the development of his own project, the analysis of initial data and the preparation of presentations.

We budgeted $1,750 p. a. for computer software licenses and services, including ArcGIS, Mathematica, etc.

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Indirect Costs We are requesting the federally agreed indirect cost of 44.1% on all direct costs, except tuition. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y1: $[illegible].

EcoHealth Alliance (EHA): Y2

PI Salary. All salaries are increased by 5% p.a. due to the exceptionally high cost of living increases in New York City. In Year 2 we will request [illegible] month's salary ($[illegible]) for PI Karesh, PI Karesh will coordinate with all PIs and Key Personnel the many partners and facets involved in this project. He will monitor the lab and field work. He will mentor the post-doctoral fellow during his/her time in NYC. PI Karesh will present and discuss initial results and potential modifications with advisors at WHO and OIE as well as at a domestic presentation. Co-PI Rostal will commit 8-mo p.a. (Y1-OY5) to the project ($[illegible]). She will work with PI Karesh to coordinate the many partners involved in this collaboration, oversee fieldwork, and coordinate research. She will make two trips to South Africa, one with PI Karesh and KP Daszak to meet with the collaborators and local stake holders assist with sampling and initiating the springbok and human studies and one to assist with sampling later in the year. She will work closely with the local project veterinarian and Key Personnel to on the various parts of the project. She will mentor the post-doctoral fellow in epidemiology during his/her time in NYC. She will work with KPs Msimang and Kemp to produce written literature for the public regarding RVFV and vector-borne diseases and design the questionnaire for the human sampling project. Co-PI Rostal will attend the DTRA Annual Technical Review.

Other Personnel. Key Personnel (KP) Hosseini will commit 2 month in Year 2 ($[illegible]). KP Hosseini will maintain the project database and will conduct initial data analyses and summaries. KP Hosseini will mentor the post-doctoral fellow in the ecology of diseases during his/her time in NYC. Key Personnel Daszak will commit [illegible] month ($[illegible]) to the project in Y2. He will work with KP Hosseini to conduct the initial data analyses, visit our collaborators in South Africa and mentor the post-doctoral fellow in the study of infectious diseases. We will have a program administrator committed to 2 month ($[illegible]). The program administrator will assist with communication among the collaborators, the hiring of the capture team and the logistics of travel for the PIs, KPs and the fellow. We will support a full-time post-doctoral fellow in epidemiology and infectious diseases, ($42,000). The fellow will collect mosquitoes from the locations of our sheep flocks, springbok herds and in Mokala National Park (MNP). He/she will also help the veterinarian with ruminant sampling and testing. He/she will make two visits to EHA to work with the NYC collaborators and train in the epidemiology and ecology of infectious diseases. He/she will begin developing his/her own project within the framework of our research plan. In Y2 he/she will also spend two months with KP Kemp learning mosquito speciation and analysis as well as assisting with the laboratory transmission experiments. The project veterinarian, 12 months ($31,500), will work closely with KP Nel, PI Rostal, KP Kemp and the post-doctoral fellow to coordinate all ruminant sampling and testing. The project veterinarian will join the stakeholder meeting and will work with KP Nel and a professional capture team to capture, sample and tag the springbok. He/she will be continue for quarterly sampling of the sheep and testing the whole blood for innate immune response (γINF). A technician will be hired for 12 months ($18,900). The technician will assist the veterinarian with all ruminant sampling, innate immune response analysis and delivering the serum samples to in one of the state veterinary laboratories.

NICD for ruminant testing. The technician will also assist with the mosquito sampling at ruminant locations when the post-doctoral candidate is in the U.S. Sampling the culled springbok will require the assistance of two members of a capture team for 0.5months ($1,350 per man per month = $2,700). In Y2 we will hire three students (the new student technician will be hired at the rate of $13,000, while the other two will receive a 5% increase for the cost of living), for a total of $40,300.

Fringe Benefits. Fringe benefits are calculated as 33.8% of base salary for PIs, KPs, program administrator and the post-doctoral fellow (they increase by 0.5% annually).

Travel.
International All flights to/from South Africa from/to New York City were calculated at $2000 RT airfare to/from Johannesburg, $2,200 round-trip airfare to/from Kimberley and $400 for flights from Johannesburg to Kimberley. Room and board for Johannesburg is $175 a day and $40 in Kimberley.
PI Karesh and KP Daszak will visit the lab and the field site once ($2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*6 days) + 67 misc. travel costs = $3,057*2 = $6,114). Co-PI Rostal will make two trips field site to oversee sampling (Trip 1: $2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*20 days) + 67 misc. travel costs = $5,217; Trip 2: $2200 airfare + ($40*14 days) + 100 misc. travel costs = $2,860). The post-doctoral fellow will make two trips to the U.S. for a total of 4-5 months. The salary is compensation for living expenses in the U.S., thus only funding for the flights will be requested ($2,200*2 trips = $4,400). Funding will be provided for PI Karesh to present our initial work at an international conference, e.g. IMED, at $4,600 (airfare $1,000, hotel ($400/night) * 6, $125/day * 6, and $350 registration).
U.S. Domestic: We are also budgeting $550 for KP Hosseini to meet with KP Anyamba at USRA ($550 = 150 train fare + $300 hotel + $100 for local transit). In Y2 we are budgeting $1,260 each for PI Rostal and the post-doctoral fellow to attend the DTRA Annual Technical Review (($500 airfare + $120/night hotel x 3d + $100/day food x 3d + $100 for transit)*2 = $2,520), and a domestic conference, e.g. ASTMH or CDC's EID conference for KP Daszak to present preliminary data.
RSA Domestic: If another vehicle is needed for the human sampling of workers at our participating farms/ranches it will be covered by JDoD RSA. We will pay for fuel for our vehicle at $0.101/km x 150km per day x 262 days = $4,000 p.a. We will pay for 2nd year Masters' students to attend and present their work at a local conference (($150 transportation + $100 registration + ($40/day*5 days) + 50 misc. transit)*2 = $1,000).

Other Direct Costs.
Materials and Supplies Funds for ruminant sampling in Y2 include $800 per flock of sheep for maintenance ($2,400). Gamma-interferon kits are $425 each and test 46 animals in duplicate p.a. We will use 20 kits ($425*20 = $8,500) p.a. For springbok sampling we budgeted $2000 p.a. to divide among the farms, as the farms in Y3-5 would normally have already culled their animals and need greater incentive the longer they keep the animals. We expect to spend $10,600 (increase of 3% p.a.) to purchase sampling materials, such as nitrile gloves, vaccutainer® tubes and needles, dry ice, netting for bomas, respirators for separating serum in the field, two portable centrifuges, and ear tags etc. We will purchase the sampling equipment for ruminants for both

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Initial capture, sampling, tagging and and vaccinating (or injecting them with saline as placebo) will require the assistance of a 10 man-capture team ($2,696 per man per month = $26,960).

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Y2 and Y3 at this time so that the meta-population sampling in Y3 can begin at the start of the year.

Mosquito trapping supplies are estimated to cost a total of $600 p.a. ($200*3).We expect to purchase 3 replacement traps in Y2.

We budgeted $5000 to purchase a computer for the PI Rostal and KP Hosseini Y3 to conduct epidemiological and ecological analyses. Masters' student's project ($3,000 per student = $6,000), as he/she may incorporate other factors or pathogens into his/her research: described in the technical report and SOW.

We are budgeting $1,575 (accounting for 3% increase p.a.) to host a stakeholders' meeting in the Free State. This will include local ranchers, farmers, veterinarians, and policy makers. We will update them on the project, introduce the human and springbok sampling projects to them and find potential participant farms/ranches for our experimental flocks/herds.

We are also budgeting $1,750 p.a. for computer software licenses and services, including ArcGIS, Mathematica, etc.

Publications: We budgeted $3,800 for publications in Y2 ($1,500 per open access journal, $2 $3,000) plus $800 for another journal.

Indirect Costs We are requesting the federally agreed indirect cost of 44.1% on all direct costs, except tuition. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y2: $228,534.

EcoHealth Alliance (EHA) Y3

PI Salary. All salaries are increased by 5% p.a. due to the exceptionally high cost of living increases in New York City. In Year 3 we will request 2 month's salary ($11,172) for PI Karesh and the remaining 1 month will be matched with non-governmental funding. PI Karesh will coordinate with all PIs and Key Personnel the many partners and facets involved in this project. He will monitor the lab and field work. He will mentor the post-doctoral fellow during his/her time in NYC. PI Karesh will present and discuss initial results and potential modifications with advisors at WHO and OIE. Co-PI Rostal will commit 8-mo p.a. (Y1-OY5) to the project ($22,369). She will work with PI Karesh to coordinate the many partners involved in this collaboration, oversee fieldwork, and coordinate research. She will make two trips to South Africa, one with PI Karesh to meet with the collaborators and local stake holders assist with sampling and initiating the metapopulation cross-sectional studies and one to assist with sampling later in the year. She will work closely with the local project veterinarian and Key Personnel to on the various parts of the project. She will mentor the post-doctoral fellow in epidemiology during his/her time in NYC.

Other Personnel. Key Personnel (KP) Hosseini will commit 3 month in Year 3 ($15,735). KP Hosseini will maintain the project database and will conduct initial data analyses and summaries. KP Hosseini will mentor the post-doctoral fellow in the ecology of diseases during his/her time in NYC. Key Personnel Daszak will commit 1 month ($25,178) to the project in Y3 and the remaining 1 month will be matched with non-governmental funding. He will work with KP Hosseini to conduct the initial data analyses and mentor the post-doctoral fellow in the study of infectious diseases. KP Daszak will attend the DTRA Annual Technical Review. We will have a

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program administrator committed to 2 month ($9,522). The program administrator will assist with communication among the collaborators, and the logistics of travel for the PIs, KPs and the fellow. We will support a full-time post-doctoral fellow in epidemiology and infectious diseases, ($44,100). The fellow will collect mosquitoes from the locations of our sheep flocks, springbok herds and in Mokala National Park (MNP). He/she will also help the veterinarian with ruminant sampling and testing, and with the metapopulation survey with ruminants, people and mosquitoes as needed. He/she will make one visit to EHA of approximately two months to work with the NYC collaborators and train in the epidemiology and ecology of infectious diseases. He/she will collect data for his/her own project within the framework of our research plan. The project veterinarian, 12 months ($33,075), will work closely with KP Nel, PI Rostal, KP Kemp and the post-doctoral fellow to coordinate all ruminant sampling and testing and initiate the metapopulation ruminant surveys of domestic and game-ranched animals of six species, including assisting with SANParks veterinarians in MNP as needed. The project veterinarian will join the stakeholder meeting. He/she will be continue for quarterly sampling of the sheep and testing the whole blood for innate immune response (γINF). Two hundred springbok will be culled and the veterinarian will oversee the sampling of our cohort and ensure the proper disposal of the vaccinated animals. Sampling the culled springbok will require the assistance of two members of a capture team for 0.5months ($1,350 per man per month = $2,700). A technician will be hired for 12 months ($19,845). The technician will assist the veterinarian with all ruminant sampling, innate immune response analysis and delivering the serum samples to NICD for ruminant testing. The technician will also assist with the mosquito sampling as needed/available during the metapopulation surveys. In Y3 we will hire two students the new student technician will be hired at the rate of $13,000, while the other will receive a 5% increase for the cost of living, for a total of $26,650 for the two student workers.

Fringe Benefits. Fringe benefits are calculated as 32.3% of base salary for PIs, KPs, program administrator and the post-doctoral fellow (they increase by 5% annually).

Travel.
International All flights to/from South Africa from/to New York City were calculated at $2000 RT airfare to/from Johannesburg, $2200 round-trip airfare to/from Kimberley and $400 for flights from Johannesburg to Kimberley. Room and board for Johannesburg is $175 a day and $40 in Kimberley.
PI Karesh will visit the field site once ($2200 airfare + ($40*6 days) + 67 misc. travel costs = $2,507). Co-PI Rostal will make two trips field site to oversee sampling (Trip 1: $2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*60 days) + 67 misc. travel costs = $5,217; Trip 2: $2200 airfare + ($40*14 days) + 100 misc. travel costs = $2,860). The post-doctoral fellow will make one trip to the U.S. for 2 months. The salary is compensation for living expenses in the U.S., thus only funding for the flights will be requested ($2,200).

U.S. Domestic: We are also budgeting $550 for KP Hosseini to meet with KP Anyamba at USRA ($550= 150 train fare + $300 hotel + $100 for local transit). In Y3 we are budgeting $1,260 for KP Daszak to attend the DTRA Annual Technical Review ($500 airfare + $120 hotel * 3 nights + $100 food * 3 days + $100 for transit).

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RSA Domestic: If another vehicle is needed for the human sampling of workers at our participating farms/ranches it will be covered by DoD-RSA via cost-sharing. We will pay for fuel for our vehicle at $0.101/km * 150km per day * 262 days = $4,000 p.a. We will pay for 2nd year Masters' students to attend and present their work at a local conference (($150 transportation + $100 registration – ($40/day*5 days) + 50 misc. transit) = $500).

Other Direct Costs.

Materials and Supplies Funds for ruminant sampling in Y3 include $800 per flock of sheep for maintenance ($2,400). Gamma-interferon kits are $425 each and test 46 animals in duplicate p.a. We will use 20 kits ($425*20 $8,500) p.a. For springbok sampling we budgeted $2000 p.a. to divide among the farms, as the farms in Y3-5 would normally have already culled their animals and need greater incentive the longer they keep the animals. For the metapopulation survey we budgeted $30 per farm (sampling 8– animals) for 50 farms per species (cow, sheep, goat and springbok; total of $6,000) and $50 per farm (sampling 8+ animals) for 50 farms per species (blesbok and kudu; $5,000) for a total of $11,000.

Mosquito trapping supplies are estimated to cost a total of $600 p.a. ($200*3). We expect to purchase 3 replacement traps in Y3.

Masters' student's project ($,000 per student = $0,000 if OY4 is accepted), as he/she may incorporate other factors or pathogens into his/her research.

We are budgeting $1,501 (accounting for 3% increase p.a.) to host a stakeholders' meeting in the Free State. This will include local ranchers, farmers, veterinarians, and policy makers. We will update them on the project, introduce the metapopulation study within the project.

We are also budgeting $1,750 p.a. for computer software licenses and services, including ArcGIS, Mathematica, etc.

Indirect Costs We are requesting the federally agreed indirect cost of 44.1% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y3: $

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EcoHealth Alliance (EHA) OY4

PI Salary. All salaries are increased by 5% p.a. due to the exceptionally high cost of living increases in New York City. In Option Year 4 (OY4) we will request 3 month's salary ($) for PI Karesh. PI Karesh will coordinate with all PIs and Key Personnel the many partners and facets involved in this project. He will monitor the lab and field work. He will mentor the post-doctoral fellow during his/her time in NYC. PI Karesh will present and discuss initial results and potential modifications with advisors at WHO and OIE. Co-PI Rostal will commit 8-mo p.a. (Y1-OY5) to the project ($). She will work with PI Karesh to coordinate the many partners involved in this collaboration, oversee fieldwork, and coordinate research. She will make two trips to South Africa, one with PI Karesh to meet with the collaborators and local stake holders assist with sampling and one to assist with sampling later in the year. She will work closely with the local project veterinarian and Key Personnel to on the various parts of the project. She will mentor the post-doctoral fellow in epidemiology during his/her time in NYC.

Other Personnel. Key Personnel (KP) Hosseini will commit 3 month in OY4 ($). KP Hosseini will maintain the project database and will conduct data analyses. KP Hosseini will

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mentor the post-doctoral fellow in the ecology of diseases during his/her time in NYC. KP Hosseini will attend the DTRA Annual Technical Review. Key Personnel Daszak will commit 2 months ($17,087) to the project in OY4. He will work with KP Hosseini and the PIs to conduct the data analyses and mentor the post-doctoral fellow in the study of infectious diseases. We will have a program administrator committed to 2 month ($4,341). The program administrator will assist with communication among the collaborators, and the logistics of travel for the PIs, KPs and the fellow. We will support a full-time post-doctoral fellow in epidemiology and infectious diseases, ($46,305). The fellow will collect mosquitoes from the locations of our sheep flocks, springbok herds and in Mokala National Park (MNP). He/she will also help the veterinarian with ruminant sampling and testing and human sampling as needed. He/she will make two visits to EHA to work with the NYC collaborators and train in the epidemiology and ecology of infectious diseases. He/she will begin the analysis for his/her own project within the framework of our research plan. The project veterinarian, 12 months ($34,729), will work closely with KP Nel, PI Rostal and the post-doctoral fellow to coordinate all ruminant sampling and testing. The project veterinarian will join the stakeholder meeting. He/she will be continue for quarterly sampling of the sheep and testing the whole blood for innate immune response (γINF), Two hundred springbok will be culled and the veterinarian will oversee the sampling of our cohort and ensure the proper disposal of the vaccinated animals. Sampling the culled springbok will require the assistance of two members of a capture team for 1 month ($1,350 per man per month = $5,400). A technician will be hired for 12 months ($20,837). The technician will also assist with the mosquito sampling at ruminant locations when the post-doctoral candidate is in the U.S., In OY5 we will hire one student for a total of $13,650.

Fringe Benefits. Fringe benefits are calculated as 33.8% of base salary for PIs, KPs, program administrator and the post-doctoral fellow (they increase by 5% annually).

Travel.

International All flights to/from South Africa from/to New York City were calculated at $2000 RT airfare to/from Johannesburg, $2200 round-trip airfare to/from Kimberley and $400 for flights from Johannesburg to Kimberley. Room and board for Johannesburg is $175 a day and $40 in Kimberley.

Co-PI Rostal will make two trips field site to oversee sampling (Trip 1: $2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*20 days) + 67 misc. travel costs = $3,617; Trip 2: $2200 airfare + ($40*14 days) + 100 misc. travel costs = $2,860). The post-doctoral fellow will make two trips to the U.S. for 6-7 months, to focus on analyses. The salary is compensation for living expenses in the U.S., thus only funding for the flights will be requested ($2,200*2 = $4,400). Funding will be provided for PI Rostal and KP Daszak to present our work at an international conference, e.g. IMED, at $9,200 (airfare $1,000, hotel ($400/night) * 6, $125/day * 6, and $350 registration*2).

U.S. Domestic: We are also budgeting $550 for KP Hosseini to meet with KP Anyamba at USRA ($550= 150 train fare + $300 hotel + $100 for local transit). In OY4 we are budgeting $1,260 for KP Hosseini to attend the DTRA Annual Technical Review ($500 airfare + $120 hotel * 3 nights = $100 food * 3 days + $100 for transit = 1,260), and a domestic conference, e.g. ASTMH or CDC's EID conference for PI Rostal to present preliminary data ($500 airfare + $340 registration = $120 hotel * 3 nights + $100 food * 3 days+ $100 for transit = $1,600).

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Deleted: Sampling the culled springbok will require the assistance of two members of a capture team for 1 month ($1,350 per man per month = $5,400).
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RSA Domestic: If another vehicle is needed for the human sampling of workers at our participating farms/ranches it will be covered by DoD-RSA as costs during. We will pay for fuel for our vehicle at $0.101/km x 150km per day x 262 days = $4,000 p.a. We will pay for the 2nd year Masters' student to attend and present their work at a local conference (($150 transportation + $100 registration + ($40/day*5 days) + 50 misc. transit) = $500).

Other Direct Costs.

Materials and Supplies Funds for ruminant sampling in OY4 include $800 per flock of sheep for maintenance ($2,400). Gamma-interferon kits are $425 each and test 46 animals in duplicate p.a. We will use 20 kits ($425*20 $8,500) p.a. , we funded springbok will be culled per, we budgeted $2000 p.a. to divide among the farms, as the farms in OY4-5 would normally have already culled their animals and need greater incentive the longer they keep the animals. We expect to spend $11,111 (increase of 3% p.a.) to purchase sampling materials for OY4 and prepare for the metapopulation sampling in OY5 in order to initiate the survey early in the year and have time to conduct analyses. These materials include, such as nitrile gloves, vaccutainer® tubes and needles, dry ice, netting for bomas, respirators for separating serum in the field, two portable centrifuges, and ear tags etc.

Mosquito trapping supplies are estimated to cost a total of $600 p.a. ($200*3).We expect to purchase 3 replacement traps in OY4.

The Masters' student will receive $3,000 for his/her project, as he/she may incorporate other factors or pathogens into his/her research.

We are budgeting $2,639 (accounting for 3% increase p.a.) to host a stakeholders' meeting in the Free State. This will include local ranchers, farmers, veterinarians, and policy makers. We will update them on the project, introduce the human and springbok sampling projects to them.

We are also budgeting $1,750 p. a. for computer software licenses and services, including ArcGIS, Mathematica, etc.

Publications: We budgeted $3,500 for publications in OY4 ($1,500 for two open-access journal),

Indirect Costs We are requesting the federally agreed indirect cost of 44.1% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for OY4: $228,805.

EcoHealth Alliance (EHA) OY5

PI Salary. All salaries are increased by 5% p.a. due to the exceptionally high cost of living increases in New York City. In Option Year 5 (OY5) we will request 2 month's salary ($19,030) for PI Karesh and the remainder will be matched with non-governmental funding. PI Karesh will coordinate with all PIs and Key Personnel the many partners and facets involved in this project. He will monitor the lab and field work. He will mentor the post-doctoral fellow during his/her time in NYC. PI Karesh will present and discuss initial results and potential modifications with advisors at WHO and OIE. PI Karesh will attend the DTRA Annual Technical Review. Co-PI Rostal will commit 8-mo p.a. (Y1-OY5) to the project ($57,858). She will work with PI Karesh to coordinate the many partners involved in this collaboration, oversee fieldwork, and coordinate research. She will make two trips to South Africa, one with PI Karesh to meet with the collaborators and local stake holders assist with sampling and implementing the metapopulation

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cross-sectional studies and one to assist with sampling later in the year. She will work closely with the local project veterinarian and Key Personnel to on the various parts of the project. She will mentor the post-doctoral fellow in epidemiology during his/her time in NYC.

Other Personnel. Key Personnel (KP) Hosseini will commit 3 month in OY5 ($18,087). KP Hosseini will maintain the project database and will conduct final data analyses and summaries with other collaborators. KP Hosseini will mentor the post-doctoral fellow in the ecology of diseases during his/her time in NYC. Key Personnel Daszak will commit .75 month ($17,941) to the project in OY5. He will work with KP Hosseini to conduct the data analyses and mentor the post-doctoral fellow in the study of infectious diseases. We will have a program administrator committed to 5 months ($15,122). The program administrator will assist with communication among the collaborators, and the logistics of travel for the PIs, KPs and the fellow. We have requested an extra month of support for the program administrator in order to assist with a smooth transition at the end of the project. We will support a full-time post-doctoral fellow in epidemiology and infectious diseases, ($48,620). The fellow will collect mosquitoes from the locations of our sheep flocks, springbok herds and in Mokala National Park (MNP). He/she will also help the veterinarian with ruminant sampling and testing, and with the metapopulation survey with ruminants, people and mosquitoes as needed. He/she will make two visits to EHA of approximately two-three months to work with the NYC collaborators and conduct epidemiological and ecological analyses. He/she will write and submit his/her own project for peer-reviewed publication. The project veterinarian, 12 months ($36,465), will work closely with KP Nel, PI Rostal, KP Kemp and the post-doctoral fellow to coordinate all ruminant sampling and testing and the metapopulation ruminant surveys of domestic and game-ranched animals of six species, including assisting with SANParks veterinarians in MNP as needed. The project veterinarian will join the stakeholder meeting. He/she will be continue for quarterly sampling of the sheep and testing the whole blood for innate immune response (γINF) in one of the state veterinary laboratories. At the end of OY5 200 springbok will be culled and the veterinarian will oversee the sampling of our cohort and ensure the proper disposal of the vaccinated animals. Sampling the culled springbok will require the assistance of two members of a capture team for 0.5months ($1,350 per man per half month = $2,700). A technician will be hired for 12 months ($21,879). The technician will assist the veterinarian with all ruminant sampling, innate immune response analysis and delivering the serum samples to NICD for ruminant testing. The technician will also assist with the mosquito sampling as needed/available during the metapopulation surveys.

Fringe Benefits. Fringe benefits are calculated as 34.3% of base salary for PIs, KPs, program administrator and the post-doctoral fellow (they increase by .5% annually).

Travel.

International All flights to/from South Africa from/to New York City were calculated at $2000 RT airfare to/from Johannesburg, $2200 round-trip airfare to/from Kimberley and $400 for flights from Johannesburg to Kimberley. Room and board for Johannesburg is $175 a day and $40 in Kimberley.

PI Karesh will visit the field site once ($2200 airfare + ($40*6 days) + 67 misc. travel costs $2,507). Co-PI Rostal will make two trips field site to oversee sampling (Trip 1: $2000 airfare + 350 ($175*2 days) + 400 airfare to Kimberley + ($40*60 days) + 67 misc. travel costs = $5,217;

Trip 2: $2200 airfare + (S40*14 days) − 100 misc. travel costs S2,860). The post-doctoral fellow will make one trip to the U.S. for 2-3 months. The salary is compensation for living expenses in the U.S., thus only funding for the flights will be requested ($2,200).

U.S. Domestic: We are also budgeting S550 for KP Hosseini to meet with KP Anyamba at USRA (S550= 150 train fare + $300 hotel + $100 for local transit). In OY5 we are budgeting $1,260 for PI Karesh to attend the DTRA Annual Technical Review ($500 airfare + $120 hotel * 3 nights + $100 food * 3 days + S100 for transit). PI Rostal and KP Hosseini will be funded to present our results at a domestic conference, e.g. ASTMH or CDC's EID ($500 airfare + $340 registration − $120 hotel * 3 nights + $100 food * 3 days + $100 for transit $1,600*2 $3,200).

RSA Domestic: If another vehicle is needed for the human sampling of workers at our participating farms/ranches it will be covered by DoD-RSA as cost sharing. We will pay for fuel for our vehicle at $0.101/km x 150km per day x 262 days $4,000 p.a.,

Other Direct Costs.

Materials and Supplies Funds for ruminant sampling in OY5 include $800 per flock of sheep for maintenance ($2,400). Gamma-interferon kits are $425 each and test 46 animals in duplicate p.a. We will use 20 kits ($425*20 = $8,500) p.a. We budgeted S2000 to divide among the final farms, as the farms would normally have already culled their animals and need greater incentive the longer they keep the animals. For the metapopulation survey we budgeted S30 per farm (sampling 8− animals) for 50 farms per species. with a 3% increase in cost p.a., (cow, sheep, goat and springbok; total of S6,000) and $50 per farm. with a 3% increase in cost p.a., (sampling 8− animals) for 50 farms per species (blesbok and kudu; $5,000) for a total of $11,000.

We are budgeting $1,088 (accounting for 3% increase p.a.) to host the final stakeholders' meeting in the Free State. We will update stakeholders on the results of the project.

We are also budgeting S1,750 p. a. for computer software licenses and services, including ArcGIS, Mathematica, etc.

Publications: We budgeted $1,900 for publications in OY5 (S1,500 for one open-access journal, and S400 for another journal = $1,900).

Indirect Costs We are requesting the federally agreed indirect cost of 44.1% on all direct costs. We have applied this IC rate to the first S25,000 of the subcontracts valued over S25,000 p.a. or for the total amount for subcontracts under S25,000. Total EcoHealth Alliance budgeted indirect costs for OY5: $212,936,

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RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 06/30/2011

*** ORGANIZATIONAL DUNS:** 077090066000 **Enter name of Organization:** EcoHealth Alliance

*** Budget Type:** ☒ Project ☐ Subaward/Consortium Previous Period **Budget Period: 2** *** Start Date:** 11/01/2014 *** End Date:** 10/31/2015 Delete Period

A. Senior/Key Person

	Prefix	* First	Middle	* Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
X	Dr.	William		Karesh		254,126.25	3.00			65,532.00	20,838.00	84,370.00
	* Project Role:	PI										
X	Dr.	Melinda		Rostal		74,370.00	8.00			49,980.00	16,393.00	66,373.00
	* Project Role:	Co PI										
X	Dr.	Parviez		Hosseini		71,362.20	2.00			11,894.00	3,901.00	15,795.00
	* Project Role:	Key Personnel										
X	Dr.	Peter		Daszak		287,175.00	2.00			47,863.00	15,699.00	63,562.00
	* Project Role:	Key Personnel										

Add Additional Key Person

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 230,100.00

B. Other Personnel

	* Number of Personnel	* Project Role	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	1	Post Doctoral Associates	12.00			42,000.00	13,776.00	55,776.00
		Graduate Students						
		Undergraduate Students						
		Secretarial/Clerical						
X	1	Program Administrator	2.00			9,068.00	2,974.00	12,042.00
X	1	Project Veterinarian	12.00			31,500.00	0.00	31,500.00
X	1	Veterinary Technician	12.00			18,900.00	0.00	18,900.00
X	2	Springbok Capture Team	0.50			2,700.00	0.00	2,700.00
X	3	Student Technicians	12.00			40,300.00	0.00	40,300.00

Add Additional Other Personnel

9	**Total Number Other Personnel**
	Total Other Personnel 161,218.00
	Total Salary, Wages and Fringe Benefits (A+B) 391,318.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
X		

Add Additional Equipment

Additional Equipment: Add Attachment Delete Attachment View Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	4,670.00
2.	Foreign Travel Costs	26,558.00
	Total Travel Cost	31,228.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	45,195.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	282,719.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	327,914.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	750,460.00

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
X	EHA Overhead	44.10	467,741.00	206,274.00
X	Indirect Costs on Subawards	44.10	282,719.00	22,050.00

Add Additional Indirect Cost

	Funds Requested ($)
Total Indirect Costs	228,324.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	978,784.00

J. Fee

Funds Requested ($)

K. * Budget Justification

(Only attach one file.) EHA Y1 CY5_DTRA CBEP RVFV Budget 9 18

Add Attachment | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 06/30/2011

*** ORGANIZATIONAL DUNS:** 077090066000 **Enter name of Organization:** EcoHealth Alliance

*** Budget Type:** ☒ Project ☐ Subaward/Consortium Previous Period **Budget Period: 3** *** Start Date:** 11/01/2015 *** End Date:** 10/31/2016 Delete Period

A. Senior/Key Person

	Prefix	* First	Middle	* Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
X	Dr.	William		Karesh		266,832.56	3.00			44,472.00	14,809.00	59,281.00
	* Project Role: PI											
X	Dr.	Melinda		Rostal		78,718.50	8.00			52,479.00	17,476.00	69,955.00
	* Project Role: Co PI											
X	Dr.	Parviez		Hosseini		74,930.31	3.00			18,733.00	6,238.00	24,971.00
	* Project Role: Key Personnel											
X	Dr.	Peter		Daszak		301,533.75	2.00			25,128.00	8,367.00	33,495.00
	* Project Role: Key Personnel											

Add Additional Key Person

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 187,702.00

B. Other Personnel

	* Number of Personnel	* Project Role	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	1	Post Doctoral Associates	12.00			44,100.00	14,685.00	58,785.00
		Graduate Students						
		Undergraduate Students						
		Secretarial/Clerical						
X	1	Program Administrator	2.00			9,522.00	3,171.00	12,693.00
X	1	Project Veterinarian	12.00			33,075.00	0.00	33,075.00
X	1	Veterinary Technician	12.00			19,845.00	0.00	19,845.00
X	2	Capture Team	0.50			2,700.00	0.00	2,700.00
X	3	Student Technicians	12.00			26,650.00	0.00	26,650.00

Add Additional Other Personnel

8 **Total Number Other Personnel**

Total Other Personnel 153,748.00

Total Salary, Wages and Fringe Benefits (A+B) 341,450.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
X		

Add Additional Equipment

Additional Equipment: Add Attachment Delete Attachment View Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	1,810.00
2.	Foreign Travel Costs	17,244.00
	Total Travel Cost	19,054.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	30,091.00
2.	Publication Costs	1,750.00
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	369,210.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	403,051.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	763,555.00

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
X	BBA Overhead	44.10	394,345.00	173,906.00
X	Indirect Costs on Subawards	44.10	369,210.00	33,075.00

Add Additional Indirect Cost

Total Indirect Costs 206,981.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	970,536.00

J. Fee

Funds Requested ($)

K. * Budget Justification

(Only attach one file.) BBA Y1 CY5_DTRA CBEP RVFV Budget 9 18

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RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 06/30/2011

*** ORGANIZATIONAL DUNS:** 077090066000 **Enter name of Organization:** EcoHealth Alliance

*** Budget Type:** ☒ Project ☐ Subaward/Consortium Previous Period **Budget Period: 4** *** Start Date:** 11/01/2016 *** End Date:** 10/31/2017 Delete Period

A. Senior/Key Person

	Prefix	* First	Middle	* Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
X	Dr.	William		Karesh		280,174.19	3.00			70,044.00	23,675.00	93,719.00
	* Project Role:	PI										
X	Dr.	Melinda		Rostal		82,654.43	8.00			55,103.00	18,625.00	73,728.00
	* Project Role:	Co PI										
X	Dr.	Parviez		Hosseini		78,676.83	3.00			19,669.00	6,648.00	26,317.00
	* Project Role:	Key-Personnel										
X	Dr.	Peter		Daszak		316,610.44	2.00			52,768.00	17,836.00	70,604.00
	* Project Role:	Key Personnel										

Add Additional Key Person

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,368.00

B. Other Personnel

	* Number of Personnel	* Project Role	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	1	Post Doctoral Associates	12.00			46,305.00	15,651.00	61,956.00
		Graduate Students						
		Undergraduate Students						
		Secretarial/Clerical						
X	1	Program Administrator	2.00			9,998.00	3,379.00	13,377.00
X	1	Project Veterinarian	12.00			34,729.00	0.00	34,729.00
X	1	Veterinary Technician	12.00			20,837.00	0.00	20,837.00
X	2	Capture Team	0.50			2,700.00	0.00	2,700.00
X	1	Student Technician	12.00			13,650.00	0.00	13,650.00

Add Additional Other Personnel

7 **Total Number Other Personnel**

Total Other Personnel 147,249.00

Total Salary, Wages and Fringe Benefits (A+B) 411,617.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
X		

Add Additional Equipment

Additional Equipment: Add Attachment Delete Attachment View Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,070.00
2.	Foreign Travel Costs	20,047.00
	Total Travel Cost	23,117.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	31,303.00
2.	Publication Costs	3,000.00
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	298,215.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	332,518.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	767,252.00

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
X	BBA Overhead	44.10	469,037.00	206,845.00
X	Indirect Costs on Subawards	44.10	298,215.00	22,050.00

Add Additional Indirect Cost

	Funds Requested ($)
Total Indirect Costs	228,895.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	996,147.00

J. Fee

Funds Requested ($)

K. * Budget Justification

(Only attach one file.) BBA Y1 CY5_DTRA CBEP RVFV Budget 9 18 | Add Attachment | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 06/30/2011

*** ORGANIZATIONAL DUNS:** 077090066000 **Enter name of Organization:** EcoHealth Alliance

*** Budget Type:** ☒ Project ☐ Subaward/Consortium Previous Period **Budget Period: 5** *** Start Date:** 11/01/2017 *** End Date:** 10/31/2018 Delete Period

A. Senior/Key Person

	Prefix	* First	Middle	* Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
X	Dr.	William		Karesh		294,182.90	3.00			49,031.00	16,817.00	65,848.00
	* Project Role: PI											
X	Dr.	Melinda		Rostal		86,787.15	8.00			57,858.00	19,845.00	77,703.00
	* Project Role: Co PI											
X	Dr.	Parviez		Hosseini		82,610.67	3.00			23,407.00	8,028.00	31,435.00
	* Project Role: Key Personnel											
X	Dr.	Peter		Daszak		332,440.96	2.00			27,704.00	9,502.00	37,206.00
	* Project Role: Key Personnel											

Add Additional Key Person

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 212,192.00

B. Other Personnel

	* Number of Personnel	* Project Role	Months Cal.	Months Acad.	Months Sum.	* Requested Salary ($)	* Fringe Benefits ($)	* Funds Requested ($)
	1	Post Doctoral Associates	12.00			48,620.00	16,677.00	65,297.00
		Graduate Students						
		Undergraduate Students						
		Secretarial/Clerical						
X	1	Project Veterinarian	12.00			36,465.00	0.00	36,465.00
X	1	Veterinary Technician	12.00			21,879.00	0.00	21,879.00
X	3	Capture Team	0.50			2,700.00	0.00	2,700.00
X	1	Program Administrator	3.00			13,122.00	4,501.00	17,623.00

Add Additional Other Personnel

6 **Total Number Other Personnel**

Total Other Personnel 143,964.00

Total Salary, Wages and Fringe Benefits (A+B) 356,156.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

	Equipment item	* Funds Requested ($)
X		

Add Additional Equipment

Additional Equipment: Add Attachment Delete Attachment View Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,010.00
2.	Foreign Travel Costs	16,784.00
	Total Travel Cost	21,794.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	27,998.00
2.	Publication Costs	1,900.00
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	377,409.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	407,307.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	785,257.00

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	* Funds Requested ($)
X	BBA Overhead	44.10	407,848.00	179,861.00
X	Indirect Costs on Subawards	44.10	377,409.00	33,075.00

Add Additional Indirect Cost

	Total Indirect Costs	212,936.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	998,193.00

J. Fee

Funds Requested ($)

K. * Budget Justification

(Only attach one file.) BBA Y1 CY5_DTRA CBEP RVFV Budget 9 18 | Add Attachment | Delete Attachment | View Attachment

Add Period

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		1,034,023.00
Section B, Other Personnel		780,485.00
Total Number Other Personnel	47	
Total Salary, Wages and Fringe Benefits (A+B)		1,814,508.00
Section C, Equipment		86,000.00
Section D, Travel		118,944.00
1. Domestic	16,520.00	
2. Foreign	102,424.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		1,791,060.00
1. Materials and Supplies	226,840.00	
2. Publication Costs	6,650.00	
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	1,557,570.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		3,810,512.00
Section H, Indirect Costs		1,125,847.00
Section I, Total Direct and Indirect Costs (G + H)		4,936,359.00
Section J, Fee		

Statement of Work

Project Title: Understanding Rift Valley Fever in Republic of South Africa

Document Date: July 1, 2013

Objective: The objective of this grant is to build a collaborative partnership with South African scientists and managers to study important aspects of Rift Valley fever virus (RVFV) epidemiology and ecology that have been neglected by previous research on the continent. The project is designed to strengthen South Africa's leadership role within the African continent for the study and control of RVFV and other vector-borne diseases. This work is vital to understanding how to manage animal populations, protect people, when and how to use vaccination protocols, and ways to reduce the risk of the virus spreading outside of Africa. It also provides the baseline data needed to better predict the spread of the virus should it ever be introduced into the United States and strengthens scientific partnerships in the region, thereby fulfilling DTRA's mandate of reducing the threat of the introduction and maintenance of a select agent into the United States.

Scope: The grantee proposes the first comprehensive study of the implications of vertebrate immunity at multiple scales, including the effect of vaccination, vector transmission dynamics and climate-ecology on RVFV ecology between and during epizootics. Grantee shall investigate RVFV life cycle, transmission by mosquitos, and immunity in domestic and wild ruminants, and humans, paired with vegetation and climate data, to increase our understanding of these integrated aspects through a One Health approach. The grantee team shall focus on the following major goals and milestones:

1. Improve the capacity for South Africa to be a regional leader in vector-borne diseases and Rift Valley fever virus epidemiology.
    - Establish collaborations of stakeholders, training of local technical personnel, training of graduate students and post-doctoral fellows, and improve official disease reporting to local and international authorities, publishing and sharing of project findings.
2. Determine how immunity against RVFV may change over time in domestic and wild ruminants (vaccinated and non-vaccinated) and be altered by animal management approaches.
    - Establish study protocols, implement and maintain field studies at individual and population scales, including the use of vaccines to simulate exposure and conduct laboratory analyses.
3. Determine the herd immunity status of free-ranging wildlife, wildlife from game farms and domestic animals in a 200Km^2 study region.
    - Establish implement and maintain field studies and conduct laboratory analyses.
4. Determine how mosquito abundance relates to weather in South Africa, the percentage of mosquitoes carrying RVFV and which ruminant species these vectors are biting.
    - Establish study protocols, implement and maintain mosquito field studies, collate weather/climate data, extend vector studies in OY4 and OY5 to examine variability between years.
5. Determine the current seroprevalence of RVFV antibodies in people working on the study farms and detect inter-epidemic transmission to people if it is occurring.
    - Improve the understanding of the widespread effect of previous RVFV outbreaks in

people from the study area.

This integrated approach represents the most comprehensive project to date to understand the epidemiology and ecology of RVFV. It is likely that herd immunity within the entire ruminant community (wild and domestic) plays a role in whether an outbreak occurs given the appropriate climatic conditions. The proposed immunity studies combined with transmission and succession data collected from mosquitoes during this project will demonstrate their relationship with the occurrence of an outbreak. This work in conjunction with a better understanding of current exposure levels and possible inter-epidemic transmission in people will improve the ability of scientists, local stakeholders and policy makers to prevent potential RVFV outbreaks. This research will have a **direct impact** on methods of managing ruminants, mosquitoes and mitigating risks to reduce or prevent future outbreaks and will likely be transferable to other nations in southern or all of Africa. It will also better inform policy makers in the U.S. to develop contingency plans should a RVF outbreak occur on American soil.

Our research will be centered in the Republic of South Africa (RSA), in areas with heightened risk of RVFV outbreaks (based on prior and future potential for occurrence). Collaborators from five RSA governmental and academic institutions (RSA National Institute for Communicable Diseases (NICD), RSA National and State Veterinary Services, RSA National Parks (SANParks), RSA Department of Defense, and University of Pretoria), as well as RSA private and livestock game ranchers, will play active and key roles in all components of the project, including study design, training, sampling, testing, and data analysis and information dissemination. The extensive involvement of South African partners will enable opportunities to advance RSA as a leader in vector-borne disease research. The proposed project duration is three years, with two optional years to allow for further advancement of research.

Background:

Rift Valley fever (RVF) is an emerging infectious disease that presents a formidable challenge for global public health and livestock producers. Its causative agent, RVF virus (RVFV) is listed as a pathogen of significant concern with the potential for international spread by several national and international defense, health and agricultural agencies, including the US DoD and CDC, WHO, and FAO. In addition to the potential risk of spread to the U.S. (intentionally or unintentionally), the virus causes large, devastating epizootics in Africa, inducing high rates of abortions in pregnant domestic ruminants, and over 90% mortality in juveniles. In addition to the economic and nutritional impacts on humans from livestock loss, transmission to humans occurs either through contact with bodily fluids and tissues of infected livestock, or via the bite of an infected mosquito. Though human infection with RVFV may be mild, it can cause hemorrhagic, neurological or hepatic disease. In recent years, RVFV has been demonstrated to cross the Red Sea, resulting in outbreaks in Yemen and Saudi Arabia.

On the basis of our project partners' work, climate has been used as a predictor of RVF outbreak occurrence and control. However, climate prediction models have not been paired with basic research necessary for understanding of the vector life cycle and its role in RVF maintenance, and the transmission pathways and immunological dynamics of RVFV. As a result, prevention and control strategies are insufficient to adequately prepare for current and potential RVF risks. Thus, there is great need to better elucidate the underlying mechanisms of RVF, especially given the potential for transmission between vectors, humans, and animals.

Key references include (Further references can be found in the Project Narrative):

Anyamba A, *et al.* Prediction, Assessment of the Rift Valley Fever Activity in East and Southern Africa 2006-2008 and Possible Vector Control Strategies. Am J Trop Med Hyg. 2010;83(2):43-51.

Kasari TR, *et al.* Evaluation of pathways for release of Rift Valley fever virus into domestic ruminant livestock, ruminant wildlife, and human populations in the continental United States. JAVMA. 2008; 232(4):514-529.

Archer BN, *et al.* Outbreak of Rift Valley fever affecting veterinarians and farmers in South Africa, 2008. S Afr Med J. 2011;101(4):263-6.

The RSA represents an ideal location for this research given the weaknesses in current understanding of RFV epidemiology there, the willingness, interest and capacity of local partners to engage in the project, the impact of RVF outbreaks to agricultural production and risks to people and trade, the abundance of wildlife and presence of game farming to facilitate the research activities needed, and the recertification of the NICD BSL-4 laboratory facilities. The study area has seen multiple RVF outbreaks in the past and hosts a variety of ruminant species – including domestic cattle, goats and sheep as well as wildlife. It hosts 23% of the game farming in RSA. Preliminary data has been obtained for this project through field studies and testing with project partners EcoHealth Alliance, SANParks, DETEA and NICD (Technical Proposal Table 1). The preliminary data has informed the study design by allowing us to target wild ruminant species with highest seroprevalence for RVFV. Furthermore, the success of collaboration with project partners to date ensures the ability to collect adequate samples for analytical statistical significance and the ability to conduct testing of samples in RSA.

Tasks/Scientific Goals: **(Format: Year #(s).Task #.Sub-task#)**

Task Y1.1-OY5.1: Improve the capacity for South Africa to be a leader in vector-borne diseases and Rift Valley fever virus epidemiology (Years 1-OY5).

Our team believes that South Africa can be a leader and model to other African nations regarding public health. Three medical entomology and mosquito identification workshops for regional professionals will be given. This will focus on techniques for trapping adult mosquitoes and larvae and their identification. A post-doctoral fellow from South Africa or southern Africa will split her/his time between EHA (conducting epidemiological and ecological analyses) and working in South Africa (working with the field and laboratory teams). We will also select two Masters' students in epidemiology and one or two (if option years are approved) Masters' students in entomology from the University of Pretoria.

Y1.1.1, Y3.1.1, OY4.1.1 Conduct an entomology workshop for participants from southern Africa.

Y1.1.2-OY5.1.2 Mentor a South African post-doctoral fellow on RVFV epidemiology.

Y1.1.3 -Y2.1.3 Train two Masters' students in epidemiology.

Y1.1.4-OY4.1.4 Train PhD student.

Y2.1.5-OY4.1.5 Train Masters' student(s) in medical entomology.

Task Y1.2-OY5.2: Field mosquito studies and corresponding satellite data (Years 1-OY5).

The grantees shall **1)** monitor rainfall conditions on a daily basis. Additionally, the vegetation conditions using normalized difference vegetation index (NDVI) shall be monitored via satellite every 10 days in our 20,000Km^2 study area; **2)** Identify the mechanistic link between mosquito abundance and succession in RSA with NDVI satellite data technology by conducting a line transect with 40km intervals, with weekly vegetation transects and daily larvae sampling of flooded *dambos* in Y1; **3)** Use a variety of traps to collect mosquitoes at selected sites for one week per site per quarter and after identification, screen pools with RT-PCR and isolate RVFV viral strains, and isolate blood-meals to analyze using PCR of the vertebrate cytochrome b gene

of mitochondrial DNA (RNA extraction will occur in a BSL-3 or more secure facility; PCR and RT-PCR will be conducted in a BSL-2 facility). **4)** Grantee shall conduct mosquito abundance and diversity sampling at the 50 ranches randomly chosen from the metapopulation investigation (see Task 6) during Y3 and OY5.

Y1.2.1 Finalize proposed protocols with collaborators and stakeholders in RSA.

Y1.2.2 Implement concurrent vegetation and dambo transects for mosquito larvae.

Y1.2.3-OY5.2.3 Collect and process mosquitoes at ruminant sampling sites.

Y1.2.4-OY5.2.3 Collect satellite derived rainfall, temperature and NDVI data.

Y3.2.5, OY5.2.5 Conduct cross-sectional mosquito study across the 20,000km^2 study site.

Task Y1.3-OY5.3: Ruminant immunological study (Years 1-OY5).

Our target ruminant community for sampling includes domestic livestock, game-ranched wildlife and free-ranging wildlife. The importance of each group and each scale will be analyzed based on the data from Task 3 and Task 5 (below). **1) Sheep flocks – Individual immunity:** We will create experimental flocks of 70 modified-live vaccinated, 70 inactivated vaccinated and 70 non-vaccinated seronegative sheep. Sheep will be maintained in the same manner as domestic stock on farms in Free State. The flocks will be sampled quarterly and tested for anti-RVFV IgG, IgM and interferon gamma (BSL-2). Each treatment group should give us different information regarding the longevity of anti-RVFV antibodies and innate immunity. Aliquots will remain in cryogenic storage at the state veterinary laboratories. **2) Game-Farm springbok – Population immunity:** We will work with commercial game ranches that raised springbok for hunting or meat. We will simulate RVFV exposure by using a modified-live vaccinated group to compare to a control group. In Y1 the 800 springbok will be captured, vaccinated (if needed), sampled, tagged, quarantined and released. Annually, 100 vaccinated and 100 unvaccinated springbok will be culled as part of the ranches' protocol. All sera will be tested by virus neutralization test (BSL-3). Unused serum aliquots will be stored in a secure serum bank at SANParks.

Y1.3.1 Vaccinate sheep for individual and population level immunoepidemiolgical studies.

Y1.3.2-OY5.3.2 Collect quarterly/annual serology in study flocks and/or herds.

Y1.3.3 Vaccinate springbok for individual and population level immunoepidemiolgical studies.

Task Y1.4, Y2.4, Y4.4: Disseminate reports to relevant stakeholders (Years 1, 2, 4).

Synthesize all data collected through the projects described above as well as capacity building activities in South Africa. A database for the extensive amount of data shall be developed and used for epidemiological analyses. Biobank sample repositories will be maintained and corresponding metadata will be available. Scientific and general reports will be generated. A stakeholder meeting will be held annually (Tasks 4 and 7- see Task 7 for Y3 and OY5, for more complete summaries to close the project) to describe the project and the current results.

Y1.4.1, Y2.4.1, OY4.4.1 Submit reports, including sample repository data, to DTRA.

Y1.4.1, Y2.4.1, OY4.4.1 Complete annual report to local stakeholders.

Y1.4.3 Disseminate preliminary serological data in a peer-reviewed publication..

Y1.4.1, Y2.4.1, OY4.4.1 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Y1.4.1, Y2.4.1, OY4.4.1 Submit and maintain samples in biobanks.

Y1.4.1, Y2.4.1, OY4.4.1 Conduct annual stakeholder meetings.

Y2.4.7, OY4.4.7 Prepare to submit publications on data collected in Years 1-4.

Task Y.2.5-OY5.5: Conduct human surveys and serological cross-sectional study (Years 2-OY5).

Grantee shall develop and publish public health information on the prevention of RVFV and vector-borne diseases for the ranchers and employees in the Free State. The information will be published in English, Afrikaans and Sestho. Grantee shall conduct annual serosurveys and written surveys of the employees (on a voluntary basis) at the ranches where the study sheep and springbok flocks/herds are located to detect possible inter-epidemic human transmission of RVFV. During the meta-population analyses a large cross-sectional study across the ranches and farms throughout our 20,000km^2 study site shall be conducted. Human serum samples shall be screened by ELISA (IgG and IgM; BSL-2) and confirmed with virus neutralization (BSL-3).

Y2.5.1 Develop written information booklet on RVFV and other vector-borne diseases.

Y2.5.2 Develop written questionnaire for risk analyses of RVFV infection.

Y2.5.3-OY5.5.3 Collect serology samples from people at the ranches in domestic and game-farm study.

Y2.5.4-OY5.5.4 Conduct written questionnaire in conjunction with blood collection.

Y2.5.5-OY5.5.5 Conduct serological analyses for human anti-RVFV IgG and IgM.

Y3.5.6, OY5.5.6 Conduct serology and written surveys for people at farms used for metapopulation study.

Task Y3.6, OY5.6: Ruminant metapopulation study (Years 3 and O5).

Grantee shall conduct a large-scale serosurvey of free-ranging and farmed wildlife and livestock herds. We propose two replicate sampling events following each rainy season in Years 3 and OY5. For six species (sheep, goats, cattle, springbok, kudu and blesbok) grantee shall sample a minimum of 400 individuals (the wild species will include samples from game ranches and Mokala National Park). A minimum of 50 individuals from three additional species (buffalo, waterbuck and kudu) and 100 nyala will be sampled. Laboratory tests include ELISA IgG and IgM (BSL-3) and VNT for wildlife (BSL-3). Data on animal movement, including birth and cull rates for ranched animals as well as trade shall be obtained by the ranch owner via a survey.

Y3.6.1, OY5.6.1 Conduct metapopulation level herd immunity survey of domestic and wild ruminants.

Y3.6.2, OY5.6.2 Store wildlife serum in SANParks biobank for future studies.

Task Y3.7, OY5.7: Epidemiological analyses and comprehensive report of project to date (Years 3 and OY5).

Grantee shall prepare the database and complete analyses on mosquito, satellite and ruminant data collected from the project to date, including metapopulation data. Grantee shall synthesize this data and prepare manuscripts for publication. A stakeholder meeting will be held annually to describe the project and the current results.

Y3.7.1, OY5.7.1 Analyze and disseminate mosquito data.

Y3.7.2, OY5.7.2 Analyze and disseminate ruminant data.

Y3.7.3, OY5.7.3 Analyze and disseminate human data.

Y3.7.4, OY5.7.4 Synthesize and report project's scientific and capacity building success to DTRA.

Y3.7.5, OY5.7.5 Prepare and submit manuscripts for publication in peer-reviewed journals.

Y3.7.6, OY5.7.6 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Task	Year 1	Year 2	Year 3	Year O4	Year O5
Task 1: Improve the capacity for South Africa to be a leader in vector-borne diseases and RVFV epidemiology					
1.1 Laboratory workshop for southern African participants					
1.2 Mentor a South African post-doctoral fellow on RVFV epidemiology					
1.3 and 1.5 Train Masters' students	Epidemiology	Epidemiology and Entomology	Entomology		
1.4 Train PhD student					
Task 2: Field mosquito studies and corresponding satellite data.					
2.1 Collect satellite weather and NDVI data					
2.2 Concurrent vegetation and mosquito larvae transects					
2.3 Collect and process mosquitoes at ruminant sampling sites					
2.4 Collect satellite weather and NDVI data					
2.5 Cross-sectional mosquito study					
Task 3: Ruminant immunological study					
3.1 Vaccinate sheep					
3.2 Collect quarterly/annual serology in study flocks and/or herds					
3.3 Vaccinate springbok					
Task 4: Disseminate reports to relevant stakeholders					
4.1 Submit reports, including sample repository data, to DTRA					
4.2 Complete annual report to local stakeholders					
4.3 Disseminate serological data in a peer-reviewed publication					
4.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review	ASTMH, IMED, or other	ASTMH, IMED, or other		ASTMH, IMED, or other	
4.5 Submit and maintain samples in biobanks					
4.6 Conduct annual stakeholder meetings					
4.7 Prepare to submit publications					
Task 5: Conduct human surveys and cross-sectional serological study					
5.1 Develop booklet on RVFV and other VBDs					
5.2 Develop written questionnaire - risk analyses					
5.3 Serology from people at the ranches					
5.4 Conduct written questionnaire		Survey of ranches		Survey of ranches	
5.5 Serological analyses: IgG and IgM					
5.6 Metapopulation serology & written surveys			Cross-sectional		Cross-sectional
Task 6: Ruminant metapopulation study					
6.1 Metapopulation level herd immunity survey of ruminants					
6.2 Store wildlife serum at SANPark biobank					
[redacted]					
7.1 Analyze and disseminate mosquito data					
7.2 Analyze and disseminate ruminant data					
7.3 Analyze and disseminate human data					
7.4 Report project's scientific and capacity building success to DTRA					
7.5 Prepare and submit manuscripts for peer-reviewed publications					
7.6 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review			ASTMH, IMED etc		ASTMH, IMED etc

From: Jon Epstein
To: (b)(6)
Cc: Aleksei Chmura; Sanders, (b)(6) ; Emma Lane; Armine Arustamyan; Evelyn Luciano
Subject: [Non-DoD Source] Re: FW: HDTRA1-17-1-0037 Inquiry
Date: Wednesday, March 28, 2018 11:56:52 AM

Dear Terrie,

We have consulted our implementing partners, and to the best of our knowledge, we do not anticipate incurring the stated level of tax in any upcoming transactions.

Please let me know if you need additional information. Also, please note that the primary administrative contact for this project is Ms. Emma Lane. Future emails should copy her, Dr. Aleksei Chmura and Ms. Evelyn Luciano - all copied here.

Cheers,
Jon

On Tue, Mar 27, 2018 at 7:55 AM, Rodriguez, Terrie M CTR DTRA ACQ FIN AND LOG (US) <terrie.m.rodriguez.ctr@mail.mil < Caution-mailto:terrie.m.rodriguez.ctr@mail.mil > > wrote:

Good Morning,

I just wanted to follow up to confirm EHA's receipt of the attached letter and e-mail string below. Kindly request EHA's response to the attached letter as soon as possible. Please do not hesitate to reach out with any questions at all.

Thank you and have a wonderful day!

Very Respectfully,

(b)(6) Contractor
Grant Specialist
TENICA & Associates LLC
Defense Threat Reduction Agency
Office Phone: (b)(6)
(b)(6)

-----Original Message-----
From: Rodriguez, Terrie M CTR DTRA ACQ FIN AND LOG (US)
Sent: Friday, March 23, 2018 10:10 AM
To: Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >; 'andre@ecohealthalliance.org < Caution-mailto:andre@ecohealthalliance.org > ' <andre@ecohealthalliance.org < Caution-mailto:andre@ecohealthalliance.org > >
Cc: (b)(6) < Caution-(b)(6)

(b)(6)
(b)(6) >
Subject: FW: HDTRA1-17-1-0037 Inquiry
Importance: High

Greetings,

As a reminder, responses due to the attached letter are requested no later than close of business today, 23 March. Please feel free to contact me with any questions.

Very Respectfully,

(b)(6) ontractor
Grant Specialist
TENICA & Associates LLC
Defense Threat Reduction Agency
Office Phone: (b)(6)
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, March 19, 2018 10:52 AM
To: Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >
Cc: (b)(6)
Caution- (b)(6)
Caution- (b)(6)
(b)(6)
(b)(6)
Caution- (b)(6)
Subject: HDTRA1-17-1-0037 Inquiry
Importance: High

Greetings,

At the direction of the Grants Officer, please see the following attachment: Foreign Tax Letter. Please acknowledge receipt of this e-mail and its attachment. Please submit your response no later than Wednesday, March 21, 2018.

Feel free to contact me if you have any questions.

Very Respectfully,

(b)(6) Contractor
Grant Specialist
TENICA & Associates LLC
Defense Threat Reduction Agency
Office Phone: (b)(6)
(b)(6)

--

JonathanH. Epstein DVM, MPH, PhD

Vice President for Science and Outreach

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4467 (direct)
(b)(6) (mobile)

web: ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

Twitter: @epsteinjon

EcoHealth Alliance leads cutting-edge scientific research into the critical connections between human and wildlife health and delicate ecosystems. With this science, we develop solutions that prevent pandemics and promote conservation.

Cover Sheet

Proposal Number	FRBAA14-6-2-0050_R
Phase I Proposal Number	FRBAA14-6-1-0043
Topic	Thrust Area 6
Proposal Title	Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 W 34th Street 17th Floor
Tax ID	311726494	**City**	New York
DUNS	0770900660000	**State/Province**	NY
CAGE		**Zip**	10001 - 2317
Website		**Country**	USA
POC Name	Dr. Jonathan H Epstein	**POC Email**	epstein@ecohealthalliance.org

Cost

Year 1 Cost ($)	816817	**Year 1 Duration (months)**	12
Year 2 Cost ($)	820195	**Year 2 Duration (months)**	12
Year 3 Cost ($)	718528	**Year 3 Duration (months)**	12
Year 4 Cost ($)	729540	**Year 4 Duration (months)**	12
Year 5 Cost ($)	681487	**Year 5 Duration (months)**	12

Applicant Certification

Organization Type	Non-Profit Organization
Are Human Subjects involved?	**No**
Are Vertebrate Animals involved?	**No**
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	**No**

Agency 1	**Contract/Grant No.**
Agency 2	**Contract/Grant No.**

Agency 3	**Contract/Grant No.**
Are you a current DoD Contractor or Grantee?	No
Agency	**Point Of Contact**
Phone #	

Principal Investigator 1

Prefix	Dr.
Name	Jonathan H Epstein
Title	Associate Vice President. Conservation Med.
Address 1	460 W 34th Street 17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2317
Phone	2123804467 Ext :
Fax	
Email	epstein@econealthalliance.org

Business Official 1

Prefix	Mr.
Name	Aleksei Chmura
Title	Authorized Organizational Representative
Address 1	460 W 34th Street 17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2317
Phone	2123804473 Ext :
Fax	
Email	chmura@econealthalliance.org

Principal Investigator 2

Prefix	Mr.
Name	Thomas Hughes
Title	
Address 1	Suite 4A Level 4 Main Office Tower, Financial Park Comp
City	Jalan Merdeka
Country	MYS
Zip	87000 -
Phone	60193928307 Ext :
Fax	

Email	tom.hughes@ecohealthalliance.org

Principal Investigator 3

Prefix	Dr.
Name	Christopher Broder
Title	Director, Emerging Inf. Diseases Grad. Prog.
Address 1	4301 Jones Bridge Road
City	Bethesda
State	MD
Country	USA
Zip	20814 - 4799
Phone	3012953401 Ext :
Fax	
Email	christopher.broder@usuhs.edu

Principal Investigator 4

Prefix	Dr.
Name	Brian Pike
Title	Naval Emerging Infectious Disease Department
Address 1	PSC 470 Box 4200
City	FPO AP
Country	SGP
Zip	96534 - 2800
Phone	6567512228 Ext :
Fax	
Email	brian.pike@fe.navy.mil

Principal Investigator 5

Prefix	Mr.

Name	Gary Crameri
Title	Research Scientist
Address 1	5 Portarlington Road
City	Geelong
Country	AUS
Zip	-
Phone	N/A Ext :
Fax	
Email	gary.crameri@csiro.au

Proprietary Information (list page numbers)	N: No
List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project.	

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein CBEP-Thrust Area 6, CC WMD Summary The henipaviruses and filoviruses include Nipah virus (NiV) and several species of Ebola (EBOV) and Marburg virus (MARV), respectively, which are highly pathogenic viruses and select agents capable of causing public health emergencies of international concern. Bats are recognized as reservoirs for both henipa- and filoviruses, and zoonotic transmission of these viruses from bats to humans has occurred in Southeast Asia. This project will enhance early detection and surveillance capacity in Malaysia by: 1) transferring Luminex-based technology with validated reagents to detect IgG antibodies against any henipa- and filoviruses to Government of Malaysia partner labs in wildlife, livestock and human health sectors; 2) training laboratory personnel to develop and utilize Luminex-based assays to identify exposure to and spillover of henipa- and filoviruses; 3) conducting biological surveillance in wildlife (esp. bats), livestock and people around indigenous communities that hunt wildlife and on farms in Peninsular Malaysia, where there are high levels of contact among people and animals. Activities will be coordinated with and complimentary to the USAID Emerging Pandemic Threats: PREDICT program and surveillance data will be shared with the Govt. of Malaysia (GoM). The proposed project is closely aligned with the aims of the Cooperative Biological Engagement Program Thrust Area 6 in that it will support biosurveillance and capability building, engages partner-country scientists, and promotes a One-Health approach to biological threat reduction.

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CBEP = Thrust Area 6 – Cooperative Counter WMD Research with Global Partners
Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Phase II Technical Proposal

I. **ABSTRACT.** The henipaviruses and filoviruses include Hendra virus (HeV) and Nipah virus (NiV), and several species of Ebola (EBOV) and Marburg virus (MARV), respectively, which are highly pathogenic viruses and select agents capable of causing public health emergencies of international concern. Bats are recognized as reservoirs for both henipa- and filoviruses, and zoonotic transmission of these viruses from bats to humans via domestic or wild animals has occurred in Southeast Asia. The full diversity of henipa- and filoviruses in bats and their potential to infect livestock and people is unknown. This project will reduce the threat from these viral agents in Malaysia by enhancing early detection and surveillance capacity in government labs by: 1) transferring Luminex-based technology with validated reagents to detect IgG antibodies against *any* henipa- and filoviruses to Government of Malaysia labs in wildlife, livestock and human health sectors; 2) training lab personnel to develop and utilize Luminex-based assays to identify exposure to henipa- and filoviruses; 3) conduct biological surveillance in wildlife (esp. bats), livestock and people in indigenous communities that hunt wildlife and on farms in Peninsular Malaysia, where there are high levels of contact among people and animals. Based on building local capacity for hypothesis driven research and improved use of technology, this project will help characterize the distribution and spillover potential from bats of henipa- and filoviruses in Peninsular Malaysia. Activities will be coordinated with, and complimentary to, the USAID Emerging Pandemic Threats: PREDICT program and serological data will be shared with the Govt. of Malaysia (GoM). The proposed project is closely aligned with the aims of the Cooperative Biological Engagement Program in that it will support biosurveillance and capability building, decrease the threat from select agents (Ebola and Nipah virus); engage partner-country scientists, and promote a One-Health approach to threat reduction.

II. SCOPE.

A. OBJECTIVE. Our overarching goal is to characterize the distribution and detect spillover of henipa- and filoviruses within indigenous populations and on farms in Peninsular Malaysia. As part of this process, we will enhance capacity at key government labs in human and animal health sectors for serological surveillance in animals and human populations for these high consequence pathogens.

B. BACKGROUND. The majority of emerging infectious diseases are zoonotic, and most originate in wildlife populations (1). Spillover from animal populations into humans is primarily driven by human activities that bring people and animals into closer contact, such as land use change, hunting, live animal trade, and agricultural intensification (2). Several emerging zoonoses have become pandemics with significant global health and economic impacts, including HIV/AIDS, SARS coronavirus, and most recently, Ebola virus disease in West Africa. Despite a growing awareness by governments that most high consequence emerging viruses come from wildlife, there is still relatively little surveillance of wildlife populations for zoonotic pathogens. Resources for disease surveillance are focused on human and domestic animal populations, which limits the possibility of early detection and prevention of outbreaks (3).

Understanding the diversity and prevalence of zoonotic agents in key wildlife species in areas where people, domestic animals, and wildlife have high degrees of contact (e.g. farms or live animal markets) can provide opportunity for early detection and response to spillover events and limit human and livestock mortality (3). Among groups of emerging zoonotic viruses, henipaviruses (Family *Paramyxoviridae*) and ebolaviruses and marburgvirus (Family *Filoviridae*) have caused outbreaks in people with high mortality rates (4, 5). Included in these viral genera are NiV and EBOV, both of which are listed as a select agents and identified by HHS and USDA as pathogens of significant threat to both human and animal health (6).

The proposed interdisciplinary research effort has three *objectives*: 1) enhance the GoM's ability to detect and respond to high priority zoonoses by transferring a Luminex-based serological assay with validated reagents to detect IgG antibodies against known and unknown henipa- and filoviruses to key government partner labs in human and animal health sectors; 2) train laboratory personnel to use this panel to screen serum samples from animals and people; 3) screen serum samples collected under the PREDICT project *and* conduct additional targeted serological surveillance in wildlife, livestock and people in indigenous communities and on farms, where there is likely to be high levels of human-animal contact. **Our overarching goals are to establish henipa- and filovirus sero-surveillance in Peninsular Malaysia, identify potential points of zoonotic transmission, and reduce the risk of outbreaks.**

We propose to test the following two hypotheses: 1) there are multiple henipa- and filoviruses in bats in Malaysia, some of which have zoonotic potential; and 2) spillover of these viruses from wildlife reservoirs (e.g. bats) has occurred, undetected, on farms and in rural indigenous communities who hunt wildlife. Both environments contain high risk interfaces where wildlife, domestic animals and people have a greater frequency of contact. Incorporating serological tests for high consequence pathogens will enhance existing One Health surveillance programs and help the government more rapidly detect and respond to spillover events at human-animal interfaces.

Henipaviruses. Nipah virus (NiV) is an emerging zoonotic paramyxovirus (genus *Henipavirus*), carried by frugivorous bats, that has pandemic potential (7). Its bat reservoir hosts are widely distributed throughout Asia and Africa, it can be transmitted directly from bats to humans, livestock to humans, and person to person, spillover has occurred repeatedly in populous and internationally connected regions, and it is associated with high mortality rates (4). NiV first emerged as a respiratory and encephalitic disease in pigs on a large-scale farm in Malaysia. Infected pigs transmitted NiV to humans, resulting in 265 infections and 105 deaths (40% mortality) (8). Fruit trees planted next to pig enclosures on the index farm created an interface where bats could drop chewed fruit, contaminated with bat saliva (and virus) into pig enclosures (9). An ecological study by our group found that NiV circulates widely in both native pteropid bat species in Malaysia (10). Industrialization and intensification of pig farming over time, coupled with having orchards next to animal enclosures, created conditions that allowed for repeated spillover from bats, persistent circulation within pigs, and ultimately a human outbreak (11). In 2014, an outbreak of NiV occurred in the Philippines in people who consumed meat from infected horses (12). In Bangladesh, outbreaks of NiV encephalitis have been recognized in people on a near-annual basis since 2001, with a mean case fatality rate of 70% and in some cases reaching 100% (13). Outbreaks in Bangladesh are seasonal, clustered within the western

part of the country, and have been linked to date palm sap consumption (13). *Pteropus giganteus*, the putative reservoir for NiV on the Indian subcontinent, feeds on date palm sap as it flows into collection pots overnight and contaminates the sap with excreta (14-16). At least 48 primary human cases, presumed to be infected directly by bats, have been identified, and human-to human transmission has occurred in many of the outbreaks (7, 13).

Filoviruses. Filoviruses circulate both in Africa and Southeast Asia, and have also been linked to bat reservoirs (17). In Africa, EBOV, formerly Zaire ebolavirus, and Sudan virus (SUDV) have caused multiple human outbreaks with mean mortality rates between 50% and 90% (5). The current EBOV outbreak in West Africa, by far the largest Ebola epidemic in history, has had more than 28,600 cases, primarily in Sierra Leone, Guinea, and Liberia, with a mortality rate of 40% (18-20). EBOV and Marburg virus (MARV) have been detected in several fruit bat species in central Africa (Congo) and Uganda respectively (21, 22), and antibodies to EBOV were detected in *Eidolon helvum* (related to *Pteropus spp.*) in Ghana (23).

Reston virus (RESTV), originally discovered in long-tailed macaques (*Macaca fascicularis*) that were imported to the US from the Philippines, is the only species of ebolavirus that has been identified in Asia (24). In the Philippines, antibodies against RESTV were incidentally detected in pigs and farmers by the US CDC while investigating a disease outbreak on pig farms (25). While it was not the primary cause of disease on these farms, RESTV spillover had occurred and was not detected by existing local surveillance platforms. In a related investigation of possible RESTV reservoirs, our group identified RESTV RNA in *Mineopterus schreibersii,* a common insectivorous bat (26). We also detected RESTV antibodies in two fruit bat species: *Cynopterus brachyotis* and *Pteropus vampyrus:* the latter is an NiV reservoir. We also found antibodies against EBOV and RESTV in 3.5% of *Rousettus leschnaultii* (n=141) in Bangladesh (27) *M. schreibersii*, *R. leschenaulti*, and two *Pteropus* species, including *P. vampyrus* are each present in Malaysia, which suggests that there may be ebolaviruses circulating there as well. While RESTV has not been associated with disease in people, it is not known whether related ebolaviruses are circulating in bats in Malaysia that have the potential to cause significant morbidity and mortality in human or animal hosts.

The sheer diversity of bat species in Asia, coupled with the likely diversity of henipa- and filoviruses, suggests that there may be significant opportunities for spillover from bats to occur. A major challenge to detecting these viruses in bats is that they 1) tend to occur at low prevalence, 2) have seasonal, yet poorly understood infection patterns, and 3) cause acute, asymptomatic infections in bats. Without large sample sizes and long-term repeated sampling, virus (RNA) detection is difficult. However, antibodies are more easily detected because they persist in individual bats and occur at higher prevalence, requiring smaller sample sizes to detect exposed individuals. This makes serology a valuable tool for identifying bat reservoirs, characterizing temporal infection patterns, and providing evidence for human or livestock exposure to bat-borne viruses(28). Enhancing human and animal surveillance for henipaviruses, including NiV, in regions where they are enzootic is critical to reducing the risk of a significant global pandemic.

Serology Luminex and its use in disease surveillance. Members of our group (Epstein, Broder, Wang, Crameri, Hughes) have been collaborating on serological based biosurveillance activities

in Australia, South and Southeast Asia and Africa using multiplex biosphere (Luminex) based assays for 10 years (29-36). The Luminex bead-based assay procedure is similar to the traditional ELISA assay both in process and reagents. The final reporter is what differs from ELISA, which uses a horseradish peroxidase and a colorimetric change read by spectrophotometer, whereas Luminex uses a fluorescent phycoerythrin reporter and microfluidics and lasers. The other fundamental difference between the two is the use of multiple beads of different colors rather than the traditional 96-wells of an ELISA. Luminex is an ideal surveillance tool due to its ability to screen for multiple targets in a single well. In less than the time it takes to run a single ELISA assay to identify one agent the Luminex multiplex assay we have developed will identify up to 25 different antibodies against multiple viral agents. The platform also has other advantages over ELISA, the dynamic range of Luminex is greater than 3.5logs, significantly more than the ELISA, helping to make analysis and development of thresholds in a surveillance setting clearer. Luminex is particularly advantageous when studying small (<20g) mammals like bats from which very little serum can be safely collected, as a relatively small volume of sera (5µl) is required to run an entire panel.

The Luminex-based multiplex serological assay for the detection of IgG antibodies specific for NiV and HeV, was first developed at the CSIRO Australian Animal Health Laboratory (AAHL) (36) and has since been expanded to include novel nucleoprotein (N) antigens (29). It is used in Australia as a surveillance tool for HeV and other related bat-borne viruses. The Broder lab significantly expanded the panel to include viral envelope glycoproteins from all known henipa- and filoviruses. **Table 1** shows the number of viral species and antigens that will be employed in the present proposal that are in-hand or in-development. This assay has been used to screen human, livestock, and bat sera in a number of international henipa- and filovirus research projects, including a 6-year longitudinal study of bats and livestock in Bangladesh (see **Preliminary Data)** and has been transferred to collaborative laboratories in the UK, Germany and China.

Table 1. Henipavirus and filovirus proteins available for this study.

	Henipaviruses	Soluble proteins	Protein tag	Coated beads #
1	Hendra virus (HeV)	G	S	#45
2	Hendra virus (HeV)	F	S	#43
3	Nipah virus (NiV)	G	S	#42
4	Nipah virus (CedFV)	F	S	#44
5	Cedar virus (CedFV)	G	S	#34
6	Cedar virus (CedFV)	F	S	#35
7	Mojiang (MojV)	G	developing	
8	Mojiang (MojV)	F	developing	
9	African henipavirus Gri-M74a	G	developing	
10	African henipavirus Gri-M74a	F	developing	
11	Hendra virus (HeV)	N	His-tag	#38
12	Nipah virus (NiV)	N	His-tag	#36
	Ebolaviruses			
13	Ebola virus (Kikwit Zaire)	Gp	TST	#33
13-1	Ebola virus (Kikwit Zaire)-T4	Gp	TST	N/A
14	Ebola virus (Kikwit Zaire)	Gp^{Δ}mucin	TST	#37
15	Sudan virus	Gp	TST	#77
15-1	Sudan virus	Gp^{Δ}mucin	TST	#64
16	Reston virus (Pennsley strain)	Gp	TST	#85
17	Reston virus (Ippolito strain)	Gp	TST	#72
18	Bundibugyo virus	Gp	developing	#68
19	Taï Forest virus	Gp	developing	#57
	Cuevavirus			
20	Lloviu virus	Gp	developing	#89
	Marburgviruses			
21	Marburg virus (Angola isolate)	Gp	S	#74
22	Marburg virus (Musoke isolate)	Gp	TST	#80
23	Ravn virus	Gp	S	#87

Table 1. Viral proteins prepared or in development and Bioplex bead currently in use.

Pan-immunoreactivity and other assay considerations. The use of the henipa- and filovirus nucleocapsid (N) proteins will be included to allow a detection of novel yet related viruses to the henipa- and filoviruses (27, 29). Dr. Linfa Wang at Duke NUS Graduate Medical School-Singapore will provide these proteins. Similarly, we will use the membrane glycoprotein (Gp) of every known filovirus from Oceania/Asia/Africa and Europe, to detect unknown or related filoviruses by antigenic cross-reactivity. By including N

and envelope glycoproteins of all known henipa- and filoviruses in a test panel, the possibility of detecting a novel or unknown henipaviruses will be significantly enhanced. Positive controls for the Luminex-based and confirmatory screening assays will be monoclonal antibodies (mAbs) and polyclonal antisera generated using the recombinant viral protein antigens. *Confirmatory assays.* The first line confirmatory tests for our Luminex-based assay will be a combination of Western blot and ELISA, using our panel of recombinant purified viral antigens or alternatively, a viral pseudovirus neutralization assay. We use **reporter pseudoviruses** as means to safely conduct neutralization assays for pathogenic viral agents (37-40) and these virus neutralization confirmation assays will be initially carried out at the Broder lab at USU, then transferred to partner labs in Malaysia. The entire filovirus panel (**Table 1**) will be constructed using a vesicular stomatitis virus (VSV)-based reporter viruses using the Indiana VSV strain (a non-pathogenic and non-select agent virus). The rescue of replication-competent rVSV reporter viruses from DNA clones is carried out in human 293T cells, as described (38, 39). *New reagent development.* **Antibodies.** The Broder lab will develop additional specific immunological reagents for the program. We have considerable experience in developing murine mAbs to numerous antigens and have already developed the largest panels of anti-G and anti-F henipavirus glycoprotein murine mAbs covering HeV, NiV and Cedar virus. In addition, we have henipavirus positive human sera available as controls for any human sera analysis (as does the GoM), and a select number of ebolavirus Gp murine mAbs. Additional murine mAb development to new viral glycoproteins is in progress at the Broder lab using recombinant human mAbs to these viral glycoproteins via phage-display technology (41-43). We will rapidly develop all required immunological control reagents covering the entire viral antigen panel shown in **Table 1** for our biosurveillance program.

Preliminary data: Serological studies of NiV and EBOV using the Luminex-based platform. Studies conducted by our group have shown that NiV viral prevalence in pteropid bats is low (~1%-3%) and there is temporal variation to shedding (10, 44, 45). Mean seroprevalence in *P. vampyrus,* which is found across Peninsular Malaysia was 32% (n=253; range 16.7% - 42.4%). In Bangladesh, we conducted a 6-year longitudinal study of *P. giganteus* using the Luminex-based platform to screen bats for IgG antibodies against both NiV and EBOV. Between 20% and 80% of adult *P. giganteus* were NiV seropositive (**Figure 1A**), while between 20% and 50%

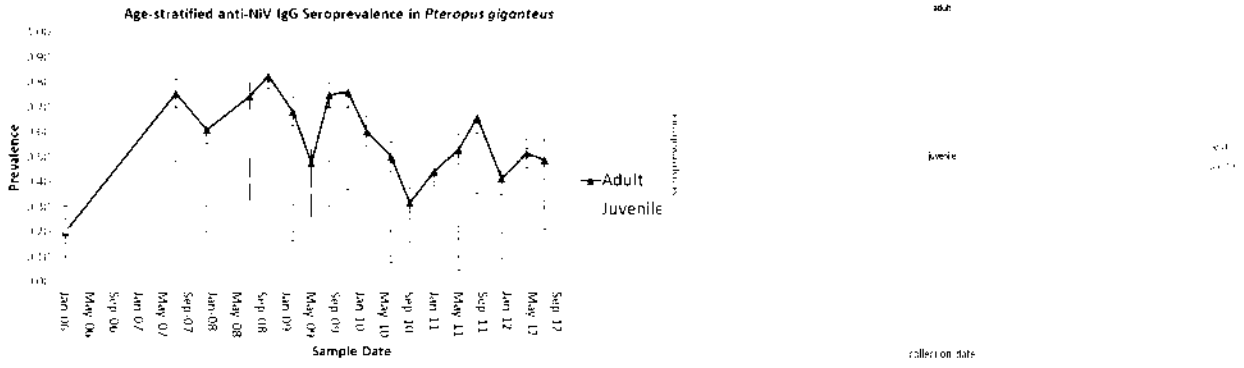

Figure 1 A (left) and B (right). Adult and Juvenile seroprevalence for NiV (A) and EBOV (B) in *Pteropus giganteus* 2006-2012, Bangladesh, shows seasonal patterns of juvenile infection. (Epstein et al., *unpub*).

were EBOV seropositive (**Figure 1B**). NiV infections appear to peak in June/July while EBOV

appears to peak in December (Epstein et al., *in prep*). We found a diversity of genetic strains of NiV in *P. giganteus* (Epstein et al., *in prep*), and viruses which are NiV-like but distinct henipaviruses (46). Non-neutralizing antibodies against NiV-like viruses found in goats, cattle, and pigs in Bangladesh suggests that spillover from bats to domestic animals occurs and that there is a broad spectrum of henipaviruses circulating in bats (31). The possibility that multiple henipa- or filoviruses capable of infecting people or livestock could be circulating in bats in Malaysia makes enhanced surveillance and early detection of these high consequence viruses critically important for reducing their threat to public health.

The Emerging Pandemic Threats: PREDICT project and the Global Health Security Agenda. The USAID Emerging Pandemic Threats: PREDICT program is a multi-year, global-scale program designed to enhance surveillance for novel zoonotic viruses in countries most vulnerable to disease emergence (47). EcoHealth Alliance (EHA) is a core implementing partner in the PREDICT consortium and the lead partner for Malaysia. EHA has also conducted research on NiV and other emerging zoonoses in collaboration with the GoM since 2001. EHA and Tom Hughes (CM), have been collaboratively implementing PREDICT activities since 2009, when the program began. EHA is formally partnered with the GoM under a memorandum of agreement that includes the Ministry of Health (MOH), The Department of Veterinary Services (DVS), and the Department of Wildlife and National Parks (DWNP). Our collaboration includes field and laboratory activities focused on detection of novel zoonotic viruses in animal and human populations in close contact (e.g. PREDICT). We have identified indigenous (Orang Asli) communities that hunt as a high risk population and have strategically sampled wildlife, domestic animals and people, at points of possible spillover from animal reservoirs. From 2009-2014, PREDICT tested wildlife samples using viral family-level PCR assays for more than 20 families, and discovered more than 800 novel viruses in bats, rodents and nonhuman primates across 30 countries. **However, serology has not been part of PREDICT's diagnostic approach.** In 2015-2017 we will characterize behavioral risk and collect biological specimens from Orang Asli in Perak state who report hunting wildlife. We will concurrently sample bats, rodents, and peridomestic animals (e.g. dogs) that live in these forested communities. We have received IRB approval and begun a 1-year pilot study in three Orang Asli communities, where we are sampling 50 individuals from each village along with wildlife and hunting dogs. Samples collected include blood, oral, and fecal specimens, and testing will be done at the National Public Health Lab (human specimens) and DWNP (animal specimens). Our surveillance approach ultimately intends to integrate serology, **however, PREDICT is in the stage of evaluating serological platforms, including Luminex and is in need of additional input for selection. This proposed project will be highly complementary to PREDICT by 1) significantly improving capacity within the GoM to efficiently screen human and animal serum samples for antibodies to henipa- and filoviruses, 2) providing critical performance data for the Luminex-based platform; and 3) supporting a One-Health approach by engaging all three sectors of wildlife, livestock, and human health through a coordinated surveillance strategy.** We will leverage substantial existing resources by screening archived sera (> 1200 animals including 945 macaques and 176 bats) and human samples (300 archived Orang Asli sera stored at NPHL). **The Global Health Security Agenda (GHSA)** is a multi-lateral initiative to enhance nations' ability to detect and respond to zoonotic disease threats. Malaysia is among the signatories to the GHSA and this project is in line with supporting the overall goals and activities set by the GHSA.

University Malaya – NMRC-A study of Orang Asli. We will also have access to Orang Asli samples collected from acutely febrile patients at Gombak Hospital that serve the Orang Asli communities, and samples from Orang Asli communities in Selangor under a separate ongoing disease study led by the Univ. of Malaya (Prof. Abu Bakar) with NMRC-A (Co-PI Pike). Under this proposal our partners at UM will screen these samples from indigenous populations which may help us identify additional risk factors (beyond direct animal contact) for exposure to henipa- and filoviruses.

This proposal is distinct from PREDICT in that it focuses solely on serological diagnostic testing of human, livestock, and at wildlife for henipaviruses and filoviruses, whereas PREDICT uses PCR assays to screen for a much broader array of viral families. While this project uses some samples collected under PREDICT and an ongoing UM-NMRC-A Orang Asli study, the proposed farm study and expanded Orang Asli forest study are new and will be completely supported by this project budget.

II. PROGRAMMATICS.

Partner Institutions and Roles: EcoHealth Alliance, NY USA. (EHA; prime) will finalize and implement the study design, coordinate overall project, co-supervise PhD and post-doctoral students, obtain relevant ethical approvals; coordinate field and lab studies; and with PREDICT project; and with relevant government agencies; co-analyze and publish data. EHA will be responsible for all contractual obligations with DTRA. Jonathan Epstein, DVM, MPH (Principal Investigator, PI); Gary Crameri, BSc (Consultant, Senior Research Scientist), Field/Research Scientist DVM/PhD (to be hired). **Conservation Medicine, Ltd., Malaysia (CM).** In-country implementation lead (also PREDICT lead). Study design; coordinate field and lab studies; *will collect wildlife, livestock, and human samples with DWNP, UPM/DVS, and MOH partners;* communicate with Govt. Malaysia partners; obtain local permits and permissions; co-analyze data, coordinate training activities & workshops. Tom Hughes BSc (Co-PI; Research Scientist); Mei Ho Lee, MS, BSc (Microbiologist/ Res. Sci.), Jimmy Lee, MSc, BSc (Field/Research Scientist), lab technician (to be hired). **Uniformed Services University, Maryland, USA. (USU)** will develop and transfer reagents to partner labs; train labs; co-supervise graduate students; analyze analysis; reporting and publication. Christopher Broder, PhD (Co-PI); Eric Laing, PhD (Post-doctoral fellow), Sophia DeSilva (PhD student). **The Naval Medical Research Center-Asia (NMRC-A)**, Singapore. Study design; coordinate UM Orang Asli study; data co-analysis & publication. Brian Pike, PhD, MPH (Co-PI; Research Scientist). **Duke-NUS, Singapore**. Provide nucleocapsid (N) protein reagents (no cost); Contribute to Science advisory Group; Data co-analysis & publication. Lin-Fa Wang, PhD (Consultant/virologist). **Department of Wildlife and National Parks (DWNP), Peninsular Malaysia.** *Collect wildlife samples and perform testing*; facilitate lab training; facilitate relevant permits and permissions for wildlife work, as appropriate; data co-analysis & publication. Frankie Thomas Sitam, MSc (Molecular Biologist/Research Officer). **National Public Health Laboratory (NPHL), Ministry of Health, Peninsular Malaysia.** *Collect Orang Asli and farm worker samples*; laboratory testing; facilitate lab training; community outreach; facilitate ethical (IRB) review; data co-analysis & publication. Khebir bin Verhasib, MD (Clinical Epidemiologist), Yukie Chen, MSc (Research Scientist). **University Putra Malaysia, Dept. of Veterinary Services, Peninsular Malaysia.** *Collect livestock samples*, coordinate with DVS field officers, acquire permits for farm study; Luminex testing; PhD student training; data co-analysis & publication. **University of Malaya (UM).** *Test*

samples from existing Orang Asli study (with NMRC) using Luminex-based platform; train/supervise PhD student under this project; results analysis & publication. Sazaly Abu Bakar, PhD (Epidemiologist / Research Scientist). **USAID Regional Development Mission for Asia (RDMA),** Bangkok. Member, Science Advisory Group (SAG). Daniel Schar VMD. Observe activities and advise.

III. RELEVANCE.

Scientific & Threat Reduction Impact: The proposed project is closely aligned with the goals of the Cooperative Biological Engagement Program. It will support biosurveillance and capability building; it will use and promote a One-Health approach to surveillance, training, and research activities, as well as engagement with government agencies. Building scientific expertise and appropriate capacity to safely and accurately detect, respond and report viral zoonotic agents will enhance Malaysia's ability to detect viral threats such as EBOV, NiV, and related viruses, **and reduce the threat caused by deliberate release or natural emergence of select agents**. This project will also support and complement USAID's Emerging Pandemic Threats PREDICT program and the GHSA by enhancing local capacity to detect spillover of known and novel zoonotic agents and providing evidence of possible spillover at high risk interfaces (47). To ensure synergy and complementarity with ongoing GoM and PREDICT programs, we will convene a Scientific Advisory Group (SAG) that includes USAID RDMA (Dan Schar), Linfa Wang, and members of the Zoonotic Technical Working Committee, a One-Health platform in Malaysia. This group will discuss results; provide input on surveillance activities, interventions and future activities.

CREDENTIALS. PI: Dr. Jonathan Epstein is a veterinary epidemiologist and the Associate Vice President at EHA. He is a technical lead for surveillance and outbreak response under the USAID Emerging Pandemic Threats: PREDICT program, a $100 million effort focused on predicting and preventing pandemic diseases. Dr. Epstein is recognized internationally for his expertise on the ecology of emerging zoonotic viruses and currently directs research and surveillance programs in West Africa, South and Southeast Asia, and China. He has led investigations of NiV, EBOV, SARS CoV and MERS CoV in Asia, the Middle East, and Africa. He has also served as a consultant for WHO, FAO, OIE, and the Institute of Medicine.
Prime Organization: **EcoHealth Alliance (EHA)** is a scientific organization, working with local partners in over 30 countries at the nexus of health, biodiversity conservation and international development. EHA has a staff of 35 in New York, including scientists (e.g. social scientists, veterinarians, ecologists, analysts, IT experts, economists), administration, and communications staff. EHA has an extensive record of publishing high quality, peer-reviewed papers, journals, briefing documents and reports, including seminal work on emerging infectious diseases and bat-borne viral zoonoses. EHA's ability to produce highly utilized and understandable science-based outputs will contribute significantly to achieving project goals and provide objective methods for tracking project utilization of project findings. In 2014, EHA became the first foreign NGO to sign a Memorandum of Agreement (MOA) with the GoM. The MOA is to study zoonotic disease in populations exposed to wildlife and includes three sectors of government: Ministry of Health, The Department of Wildlife and National Parks, and The Department of Veterinary Services.
Partners: **Co-PI Mr. Gary Crameri** (Consultant, **EcoHealth Alliance**). Mr. Crameri has served as a senior laboratory scientist at the CSIRO Australian Animal Health Laboratory for over 30 years. He has been instrumental in developing diagnostic assays for henipa- and filoviruses,

including the Luminex-based platform described in this proposal. Drs. Epstein, Broder, Wang and Crameri have collaborated on NiV related research for more than 10 years.

Conservation Medicine, Ltd. (CM) is based in Kuala Lumpur and dedicated to emerging infectious disease research and capacity building in Malaysia. **Co-PI Mr. Tom Hughes** has worked with EcoHealth Alliance since 2005 and is the country coordinator for EHA Malaysia projects under PREDICT. CM works with EHA to implement field and lab work, and maintains communications with the GoM's MoH, NPHL, DWNP, UPM and DVS. Expertise includes wildlife capture and sampling, microbiology/lab diagnostics, biosafety, and qualitative risk assessment methods. CM has animal capture and sampling equipment, and field transportation.

Uniformed Services University, Maryland. Co-PI Prof. Christopher Broder and his lab have considerable expertise in the design, construction, expression and purification of viral envelope glycoprotein antigens. His current research focuses on virus-host cell interactions, vaccines and antibody therapeutics development for HIV and emerging zoonotic viruses including NiV, HeV and animal model development; EBOV and MARV. Major research contributions include the development of the first oligomeric, HIV-1 soluble gp140 glycoprotein and Hendra/Nipah soluble G glycoprotein subunit vaccine (1st commercial vaccine against a BSL-4 agent (Zoetis, Inc.) and development of antiviral human monoclonal antibodies against NiV and HeV. **Naval Medical Research Center, Asia (NMRC-A). Co-PI Dr. Brian Pike**. A U.S. Navy research scientist, Dr. Pike has more than 20 years of experience in molecular biology and he presently serves as the Navy's Southeast Asia lead in emerging infectious disease research. With a principal interest in zoonosis, Dr. Pike's accomplishments have ranged from describing the emergence of falciparum malaria to the detection of novel retroviruses in subsistence hunters in Cameroon and he has ongoing studies in MERS-CoV, dengue, as well as cohorts established for the detection of novel emergent pathogens.

Department of Wildlife and National Parks (DWNP). The national wildlife authority for Malaysia. Frankie Sitam is an experienced molecular biologist and wildlife officer and has trained in field and laboratory techniques under PREDICT, including use of PPE and molecular viral diagnostic techniques. DWNP will complete (2016) a new BSL2 genetics and disease diagnostic lab. The lab will include PCR suites, a serology suite where the Luminex platform will be installed, and ultra-cold storage. PERHILITAN has equipment for wildlife capture and sampling and field transportation, and officers are trained in bat and macaque capture and sampling techniques.

National Public Health Laboratory (NPHL), Ministry of Health. The national diagnostic laboratory for the Ministry of Health. NPHL has multiple BSL2 and BSL3 diagnostic suites and is equipped with molecular diagnostic tools (including the PREDICT viral family level PCR assays and controls) as well as basic serology (e.g. ELISA). MoH and NPHL will lead the human sampling activities in Orang Asli communities and on farms and field staff are fully trained for human clinical work.

University Putra Malaysia (UPM), Department of Veterinary Services: Dr. Latiffah Hassan. Dr. Hassan is a veterinarian and professor of epidemiology and head of the virology lab at UPM. She has worked on research related to livestock pathogens and zoonotic diseases, including Nipah virus (with EcoHealth Alliance), since 2000.

University of Malaya (UM). Professor Sazaly Abubakar. Dr. Sazaly has been involved in infectious disease research for over 20 years. Among his notable contributions include leading the team that provided the first molecular evidence of NiV transmission from pigs to humans, and the identification of the presence of more than one NiV strains during the outbreak in

Malaysia. Dr. Sazaly is the Editor and Chairperson of the subcommittee in establishing Malaysia's first Biosafety and Biosecurity Policy and Guideline under the Ministry of Health, and the Chairman of UM Institutional Biosafety and Biosecurity Committee. Currently, Dr. Sazaly is the Director of Tropical Infectious Diseases Research and Education Centre (TIDREC), a Centre of Excellence in UM that was established in 2008 as a dedicated one-stop research centre for the advancement of knowledge in tropical infectious diseases, especially neglected tropical infectious diseases that have potential impact on the global community.
Duke-NUS Graduate Medical School, Singapore. Professor Linfa Wang. An international leader in viral discovery and bat-borne viral diagnostics, Professor Linfa Wang has led seminal research in HeV, NiV and SARS diagnostics, viral discovery, and bat immunology.

IV. WORK TO BE PERFORMED.

A. GENERAL. This project aims to develop capacity to detect antibodies against all known and potentially novel henipa- and filoviruses – two groups of select agents, in wildlife, livestock, and people at risk of exposure to animal reservoirs. Serological surveillance can identify points of zoonotic transmission and prevalence of exposure that may have been previously undetected in human or livestock populations. Early detection of human or livestock infection (natural or deliberate) can allow the GoM to more quickly establish interventions that reduce the risk of henipa- or filoviruses emergence in human populations. This project will provide the first longitudinal study of exposure to NiV, EBOV, and other related viruses in human populations known to have high degree of contact with wildlife or livestock, specifically Orang Asli and farm workers. This study uses a One-Health approach and will strengthen existing partnerships among departments of the GoM responsible for human, livestock, and wildlife health. The data generated by this study will strongly support the aims of DTRA CBEP and the USAID Emerging Pandemic Threats PREDICT program by establishing proof of concept for the use of a Luminex-based multiplexed serological platform which can easily be scaled to other important geographies where henipa- and filovirus bat reservoirs occur (e.g. Thailand or Bangladesh). Through the development of lab capacity, joint multi-sectoral field surveillance activities, and graduate student training, Malaysia's capacity to detect and respond to emerging zoonoses will be significantly strengthened, and we will provide important data regarding the circulation of henipa- and filoviruses in natural reservoirs. All serum samples will be collected in duplicate and preserved in biobanks in Malaysia in partner labs with all relevant metadata collected at the time of sampling.

SUMMARY.

Year 1. Task 1. Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. **Task 2**. Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. **Task 3**. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform. **Task 4**: Serological survey of humans, wildlife, and peri-domestic animals in Orang Asli community. **Task 5**. Develop serological study of farm workers, livestock, and wildlife around farms. **Task 6**. Disseminate reports to relevant stakeholders
Year 2. Task 1. Continued: Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. **Task 2**. Continued: Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. **Task 3**: Continued: Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a

Luminex-based platform. **Task 4**. Continued: Serological survey of humans, wildlife, and peri-domestic animals in Orang Asli community. **Task 5**. Begin serological survey of farm workers, livestock, and wildlife. **Task 6:** Communicate progress to stakeholders.
Year 3. Task 1. Continued: Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. **Task 2**. Continued: Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. **Task 4**. Continued: Serological survey of humans, wildlife, and peri-domestic animals in Orang Asli community. **Task 5**. Continued: serological survey of farm workers, livestock, and wildlife. Epidemiological analysis of serological data. **Task 6**: Comprehensive report of project completed. Disseminate reports to relevant stakeholders
Year 4 (optional). Task 1. Continued: Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. **Task 2**. Continued: Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. **Task 4**. Continued: Follow-up serological survey of Orang Asli who hunt wildlife, wildlife, and peri-domestic animals. **Task 5**. Conduct follow-up serological survey of farm workers, livestock, and wildlife. **Task 6**. Epidemiological analysis of serological data.
Year 5 (optional). Task 1. Continued: Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. **Task 2**. Continued: Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. **Task 4**. Continued: Follow-up serological survey of Orang Asli who hunt wildlife, wildlife, and peri-domestic animals. **Task 5**. Continued: Conduct follow-up serological survey of farm workers, livestock, and wildlife. **Task 6**. Epidemiological analysis of serological data. Final reports provided and manuscripts prepared.

DETAILED TASKS.

Year 1. Task 1: Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. (Year 1-OY5). *Description and execution*: The GoM has been engaged in using a One-Health approach to zoonotic disease surveillance since the NiV outbreak in 1998 and most recently via collaborations with EHA under PREDICT. Adding a serological component to surveillance will greatly enhance the government's ability to detect both known and unknown henipa- and filoviruses in wildlife reservoirs, domestic animals and human populations at risk for spillover. To establish this capacity, EHA will provide a BioRad Bio-Plex 200 machine with computer console to NPHL and DWNP. Professor Broder (USU) will provide reagents for all henipa- and filovirus assays. Prof. Linfa Wang (**at no cost**) will provide N proteins for the nonspecific henipa- and filovirus assays. Following installation, Co-PI Broder, his post doc, and Mr. Crameri will hold a 10-day training course for lab technicians at DWNP, NPHL, including staff from UM; UM has a Luminex machine and will receive assay reagents through this project. UPM will receive Luminex + training in Y2. Co-PI Hughes and team will identify archived sera from wildlife and Orang Asli collected by the PREDICT project to use for training purposes and to be screened under **Task 3**. Technicians from partner labs will screen archived sera to reinforce training. PI Epstein and Co-PI Broder will co-supervise a PhD student at USU who will develop additional assay reagents in Y1-OY5. Prof. Abu Bakar (UM) and Co-PI Pike (NMRC-A) will identify 1 PhD or 2 Masters' students at UM to train under the project with co-supervision from Mr. Hughes and Dr. Epstein (Y1-Y3 and OY4-OY5); Prof. Hassan will identify 1 PhD student at UPM, co-supervised by Dr. Epstein, to work under farm study. Each

GoM partner lab may identify a staff scientist to receive advanced training in viral pseudo-type assay development at USU. Trainees may bring sero-positive samples to USU to confirm. Co-investigators and in country partners will work closely to analyze serological results and plan Y2 activities. A project database will be developed. Co-investigators and the Science Advisory Group (SAG) will meet in Y1 (aligned with training) to discuss plans and coordinate activities. *Resources:* EHA: 2 research scientists, 1 administrative assistant, (to coordinate project activities, support field activities and facilitate communications among partners), 1 consultant (Crameri) to facilitate Luminex transfer/troubleshooting and conduct lab training and 4 subcontractors: (CM) 3 scientists to coordinate training activities and with PREDICT; (USU) 1 post doc, 1 PhD student, 1 research assistant to coordinate reagent development, transfer, and training; (NMRC-A) & (UM) 2 scientists to coordinate UM collection from Orang Asli and serological testing using Luminex, 1 PhD student or 2 Masters students. (UPM): 1 research scientist, 1 PhD student. *Metrics of success*: Luminex-based assays transferred to government lab partners; lab personnel trained; archived samples tested; UM and UPM graduate students identified; database developed. *Deliverables*: Government surveillance capacity enhanced, scientists and students trained. *Subtasks*: (*Format Year#.Task#.Subtask#*) *1.1.1.* Grantee shall transfer BioRad Bio-Plex 200 to NPHL and DWNP labs; *1.1.2-2.1.2.* Grantee shall transfer Luminex-based filovirus and henipavirus reagents to DWNP, NPHL, and UM labs; *1.1.3.* Conduct lab training; *1.1.4* identify 1 UM PhD or 2 Masters' students & 1 UPM PhD student; 1.1.5 convene the SAG (at times and places specified in the schedule); 1.1.6 develop database for serology results and sample metadata; establish sample repository at partner labs. 1.1.7. pseudovirus development training at USU.

Task 2. Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. *Description and execution.* We will engineer soluble and secreted versions of henipa- and filovirus glycoproteins, expressed in mammalian cell culture systems to accurately reflect proper synthesis including their assembly and processing into properly glycosylated higher order complexes (51). Constructs are designed and tested in pilot experiments for expression and analysis, and then used to establish stably expressing cell lines. Preparative amounts of the various soluble viral glycoproteins will be made using serum-free culture conditions in suspension culture, and proteins are purified using the appropriate tag protocol (either S-tag or double strep tag (TST)) by affinity chromatography, followed by concentration and size exclusion chromatography. These antigens have been shown to be ideal serological assay reagents in both Luminex and ELISA and have been used extensively on the Luminex-based platform. In Y1-2 we will produce Mojaing virus (MojV) and African GH-M74a G glycoproteins; Bundibugyo virus (BDBV), Tai Forest virus (TAFV), Lloviu virus (LLOV), MARV Ravn, SUDV, SUDV GpΔmucin, RESTV (monkey), and RESTV (porcine) Gp glycoproteins. We will test the utility of each individual glycoprotein by Luminex, ELISA and Western blotting then provide all necessary reagents to partner labs to accomplish the testing under this project. *Resources.* EHA: 1 scientist and 1 administrative assistant to co-supervise PhD student at USU producing reagents and coordinate transfer of reagents to Malaysia; 1 subcontractor (USU): 1 scientist (Co-PI Broder), 1 post-doc (Laing); 1 PhD student; and 1 research assistant. Duke-NUS, Singapore (Linfa Wang) shall provide N proteins for henipa- and filovirus nonspecific assays at no cost. *Deliverables.* Development of reagents; transfer to Malaysian partner labs; *Subtasks:* 1.2.1-2.2.1 develop remaining specific reagents; 1.2.2-3.2.2 use the completed viral glycoprotein preparations and produce polyclonal rabbit serum to each

individual glycoprotein; test the utility of each individual glycoprotein by Luminex-based, ELISA and Western blotting assays; 1.2.3 provide N protein reagents to detect novel henipa- and filoviruses to partner labs. 1.2.4-OY5.2.4: If novel henipa- or filoviruses are detected using molecular assays (under PREDICT), grantee may develop new reagents for antibodies against these viruses and negative sera will be re-screened.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform (Y1). *Description and execution.* We will screen up to 900 macaque and 175 bat archived serum samples collected under PREDICT and stored at DWNP, up to 300 archived Orang Asli samples stored at NPHL, and up to 200 Orang Asli samples at UM. The number of samples will depend on serum volume and quality. Results will be used to inform the farm and Orang Asli studies described in **Tasks 4 and 5**. Positive sera may be sent for confirmatory testing at USU using pseudovirus serum neutralization assays, ELISA, or Western blot. Results will be entered into a database and shared with government partners. *Resources*. (EHA) 1 scientist, 1 administrative assistant to coordinate communication and reporting; 3 subcontracts: (CM) 1 scientist and 1 lab technician will identify archived samples and assist with testing at DWNP and NPHL; (USU) 1 PhD student and 1 research assistant will perform confirmatory testing (pending permits to export samples); (UM) 1 lab scientist may identify archived Orang Asli samples and screen for henipa- and filovirus antibodies. *Metrics of success*: archived samples identified and screened; *Deliverables*: archived Orang Asli samples and bat & macaque serum samples screened at NPHL, UM, and DWNP labs; results entered into database and communicated to relevant stakeholders. *Subtasks*: 1.3.1 identify suitable archived animal and human sera; 1.3.2 screen sera for henipa- and filovirus Abs; 1.3.3 confirm positive results with western blot or pseudovirus assay; 1.3.4 enter results into database and analyze.

Task 4. Serological survey of Orang Asli, including those who hunt; associated wildlife, and peri-domestic animals. (Y1-OY5). *Description and execution.* Indigenous communities living in forested areas and that practice subsistence wildlife hunting are at higher risk of exposure to zoonotic viruses due to handling and butchering wildlife and therefore contact with bodily fluids. In **Y1** of this project, we will apply for IRB ethical approval to continue and expand from a pilot study currently underway (expected completion: Oct 2016). Pending IRB and IACUC approval, CM, MoH, and DWNP will work together in **Y1-Y2** to sample 100 individuals from each of 3 Orang Asli communities in Perak State (incl. Kuala Lipis and Gua Musang), **totaling 300 human blood samples**. 100 people sampled per community will allow us to detect a seropositive individual with 95% confidence at a prevalence of 3%, assuming a population of 500 individuals. We will also aim to sample blood from 50 bats per each of 3 species around each study village (e.g. *Miniopterus*, *Pteropus*, and *Rousettus* spp); 30 nonhuman primates; and 30 dogs, if present, in order to be able to detect henipa- or filovirus antibodies in an individual with 95% confidence given a 5% seroprevalence (in bats) and 10% in dogs and nonhuman primates. MOH officers and CM will collect blood from Orang Asli and associated animals, and serum will be separated either in the field or at partner labs and stored at -86C at prior to testing. A sample size of 50 bats would allow us to detect differences between study locations (or time points, should we conduct follow-up studies) of 56% with 95% confidence and 80% precision. **Under this DTRA project,** CM and NPHL will test up to 300 Orang Asli; CM and DWNP will test up to 450 bat and 90 nonhuman primate samples; and CM and UPM will test 90 dog samples for henipa- and filovirus antibodies using the Luminex-based platform. Note: PREDICT will

support the concurrent collection of swab samples (e.g. throat, nasal, rectal, urogenital) by this team from animals and people and testing them for henipavirus and filovirus RNA. Results will be shared between the two projects to enhance outputs and knowledge of these viral groups. UM and NMRC-A will screen 500 Orang Asli sera per project year collected from acute febrile patients at Gombak Hospital and non-symptomatic volunteers from communities in Selangor state under a concurrent, separately funded (State Dept. study of tick-borne illness) study led by Prof. Abu Bakar (UM) and Co-PI Pike (NMRC-A). Subjects enrolled in this study are well characterized and will include those with and without a history of animal contact. Under our project, those serum samples will be tested by UM using the Luminex-based platform. A lab scientist from NPHL and DWNP may travel to USU with positive samples from this study as part of a 2-week training to learn pseudovirus assay development for serum neutralization assay performance. We aim to conduct a follow-up study of Orang Asli forested communities in Y3. *Resources:* (EHA) 2 research scientists and 1 admin asst. to coordinate sampling and testing activities, reporting and data analysis and to co-supervise student at USU and UM [samples collected +tested by CM, DWNP, and MoH]; 4 subcontractors: (CM) 2 research scientists to oversee sample testing and data management & coordinate lab activities with GoM partners, 1 lab technician to assist with testing; (USU) 1 post doc, 1 PhD student 1 research assistant to coordinate training and confirmatory testing; (NMRC-A) & (UM) 2 scientists, 1 PhD student to coordinate UM sample collection from Orang Asli and serological testing; GoM (staff and logistics may be provided by DWNP and MOH). *Metrics of success*: IRB and IACUC approval for expanded Orang Asli study; Orang Asli and animal samples collected in **Y1-Y2**, screened by NPHL, UPM, UM, and DWNP for henipa- and filovirus Abs; positive results confirmed; results entered into database; samples archived and documented; results analyzed and follow-up studies planned for **Y3-OY4**. *Deliverables*: Human and animal sera collected and tested for henipa- and filovirus antibodies; data entered into database; relevant stakeholders informed of results. *Subtasks: 1.4.1.* apply for IRB/IACUC; 1.4.2-OY4.4.2. Orang Asli, wildlife, and peridomestic animal samples collected & tested; 1.4.3. Results entered into database; 1.4.4 2.4.4 Positive samples confirmed; 1.4.5. Follow-up studies planned with GoM; 1.4.6. Analyze data.

Task 5. Develop serological study of farm workers, livestock, and wildlife around farms. (Y1-OY5) *Description and execution.* NiV originally emerged on a large-scale pig farm in Ipoh, Perak. In the Philippines, RESTV has also emerged on pig farms and in both cases farm workers were infected. We aim to conduct serological surveillance of farm workers and livestock on 2 large-scale farms (>5000 ruminants and/or pigs) and 2 small-scale farms (500-1000 ruminants and/or pigs) and wildlife living proximal to the farms to detect exposure to (and potentially spillover of) henipa- or filoviruses. **Note: we now have full support from the Department of Veterinary Services for this study** (see letters). In Y1 we will work with UPM, DVS, MOH, DWNP and the SAG to discuss study design and feasibility for identifying and accessing appropriately sized farms. We will visit potential study sites and locate bat caves or roosts proximal (~25km radius) to each farm, meet farm owners, and characterize the livestock. We will use this planning year to obtain all necessary IRB and IACUC approvals. We will conduct sampling in Y2-Y3, pending approvals, and conduct a follow-up study in OY4 and OY5 (if funded). *Resources.* (EHA). 2 research scientists and 1 admin asst. to coordinate communication and attend meetings; convene SAG; prepare ethical approval applications; 1 subcontract: (CM): 2 scientists and 1 admin assistant to coordinate and attend meetings with GoM partners; conduct scoping visits to farms; prepare ethical approval applications; (UPM) 1 Research scientist, 1 PhD

student; DWNP, MoH, DVS will attend meetings and visit farms as part of scoping activities. *Metrics of success*: Meeting with all GoM partners and SAG to design study; scoping visits to farms; submission of research permit and ethical approval applications in US and Malaysia. *Deliverables*: planning meetings with relevant GoM departments; visit/select farms; apply for permits/ethical approval. *Subtasks:* 1.5.1 Apply for IRB and IACUC approvals. 1.5.2. Conduct scoping visits to farms, characterize livestock and local wildlife species.

Task 6. Disseminate reports to relevant stakeholders (Y1-OY5). Grantee shall synthesize all data collected through the projects described above as well as capacity building activities in Malaysia. Scientific and general reports will be generated and provided to GoM partners and an annual report to DTRA. *Resources*: EHA: 2 research scientists, 1 admin assistant, to conduct analysis; compile results and report; supervise PHD students; facilitate communication between partners, develop project database and ensure data management for reporting, develop annual report for DTRA and a summary report for stakeholders; 4 subcontractors: CM 3 research scientists, 1 admin assistant to oversee database & data entry, compile results, facilitate communication among stakeholders; USU 1 research scientist, 1 post-doc, 1 PhD student, 1 research assistant to collate all results and products developed under the above projects; UPM 1 research scientist and 1 PhD student to prep for farm study; NMRC-A & UM; 2 scientists, 1 PhD student to assist with data analysis. *Metrics of success*. Completion of annual report with sample metadata to DTRA Thrust Area 6; completion of scientific report with preliminary analyses to local stakeholders. *Deliverable*s: Communication via reports; reports provided to local stakeholders; PhD students report progress to supervisors, database created. *Subtasks*: 1.6.1-OY5.6.1 submit reports to DTRA. 1.6.2-OY5.6.2 Complete annual report to local stakeholders. 1.6.3-OY5.6.3 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review. 1.6.4-OY5.6.4 Conduct annual stakeholder meetings. 3.6.7-OY5.6.7 Prepare and submit publications.

Year 2. Task 1: Continued: **Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. (Year 1-OY5).** *Description, execution, and resources*: Continued use of Luminex platform at GoM labs; PhD student at UM and UPM enrolled and projects identified. *Deliverables*: Capacity built for serosurveillance in Malaysia and graduate students trained. *Subtasks*: 2.1.1. Transfer any new henipa- and filovirus reagents to partner labs; *2.1.2* UM 1 PhD or 2 Masters' student and UPM 1 PhD student project identified; 2.1.3. GoM lab personnel trained at USU.

Task 2. Continued: Develop and validate new reagents to improve the Luminex-based panel for henipa- and filovirus antibody detection. *Description, execution and resources:* as in Y1. *Metrics of success:* new reagents developed and validated that expand sero-platform; *Deliverable:* new reagents; *Subtasks:* 2.1.1 complete production of MoJ and African GH-M74a F glycoproteins. 2.1.2 Generate mAbs to the African GH-M74a and MoJ G glycoproteins, the BDBV, TAFV, LLOV, RESTV Gp glycoproteins & test by Luminex, ELISA and Western blotting. 2.1.3 If novel henipa- or filoviruses identified by PREDICT, develop specific Luminex-based reagents for antibodies against these viruses and re-screen negative sera.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using Luminex-based Platform. *Description, execution, and resources*. As in Y1. *Metrics of success*. Results from Luminex-based assay analyzed and positive samples sent to USU for confirmatory testing (with lab staff as necessary); results entered into database

Deliverables. Final test results for archived samples. *Subtasks* 2.3.1. positive samples tested using confirmatory assay; 2.3.2. final results entered into database and analyzed.

Task 4: Continued: Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. *Description, execution and resources.* We will analyze results from initial study (Task 4, Y1) and plan follow-up with MoH in Y3. Apply for IRB approval. *Metrics of success* data analyzed (in concordance with UM study and PREDICT molecular data); discussions with MoH and UM regarding a repeated sampling in Y3; application for ethical review submitted; *Deliverables*: plan for longitudinal surveillance in the same Orang Asli communities developed. *Subtasks*: 2.4.1 analyze serology data 2.4.2 evaluate serology along with molecular data from PREDICT, 2.4.3. enter results into database; 2.4.4 share results with partner labs.

Task 5. Continued: Serological study of farm workers, livestock, and wildlife around farms. (Y2-Y3, OY4.5.2-OY5) *Description and Execution.* We will select 2 large-scale farms (> 5000 mammals (e.g. pigs, goats, cows) and smaller-scale farms (<1000 animals). We will target 4 bats species, 50 bats per species (e.g. *P. vampyrus, C. brachyotis, M. schreibersii,* and *R. leschenaultii* as potential reservoirs for henipa- and filoviruses) and sample populations near study farms. This sample size will allow us to detect a single exposed individual with 95% confidence, given an estimated seroprevalence of 5% in the population. Other bat species may be included depending on results from **Y1 Task 3 and 4**. We may also sample 30 macaques, and 30 dogs captured proximal to each farm, which will allow detection of an exposed individual with 95% confidence given a prevalence of 10%. In a study of dogs in an Ebola endemic area of Gabon, 26-30% were seropositive(52). We will target 50 of each mammalian livestock species per farm, which will allow us to detect differences in seroprevalence of 46% between species and farms with 95% confidence and 80% power. *Animal sampling techniques*: All sampling is non-destructive, with each animal released at the point of capture after samples are collected. All team members (Epstein, Hughes, J. Lee, MH. Lee, and DWNP&DVS field officers) are vaccinated against rabies and fully trained in the use of personal protective equipment appropriate for the capture, handling and sampling of wildlife or livestock (available at http://bit.ly/1U7f2hB). PREDICT sampling protocols (also used here) are IACUC approved (UC Davis). Bat capture, sampling and PPE are described in detail by PI Epstein in (28). Briefly, bats are captured using mist nets or harp traps. Each bat is immediately removed after capture and placed into a cotton bag until sampled (within 6 hours of capture). Pteropid bats are anesthetized using either isoflurane gas or medetomidine/ketamine injection. Smaller bats are manually restrained. Blood is collected via the brachial, cephalic, or saphenous vein. For small insectivorous bats, blood is collected using either a hematocrit tube or a pipette gun followed by placement in buffered saline. Blood from larger animals (>100g) will be collected and placed into a serum separator tube and placed on ice. Serum may be separated in the field or in the lab, depending on timing of return to the lab. Serum samples will be placed in liquid nitrogen and transferred to -80C freezers in the DWNP or NPHL lab. Macaques will be captured and sampled by experienced DWNP officers using appropriate PPE, according to PREDICT protocols ((available at http://bit.ly/1U7f2hB). Blood samples will be collected from animals and people and serum separated either in the field or in the lab. All samples will be divided into 2 aliquots and stored at respective partner labs. [The PREDICT project will support additional sample collection: oropharyngeal swabs, fecal samples, and urine, or molecular analysis]. We will aim to enroll farm workers who have contact with animals to be screened for exposure as well. A questionnaire will be developed to collect data from farm workers about their history of contact

with animals. We will complete one round of sampling on all four farms in Y2, and conduct a second round of sampling on the same farms in OY4 and 4 additional farms in OY5, if approved. *Resources:* EHA 2 research scientists to help develop study design and implement sampling; 2 subcontractors: (CM) 3 research scientists to help develop and implement study; lab technician to support diagnostic testing at partner labs; relevant GoM partners (DVS, DWNP, MoH) may provide field and laboratory staff and transportation to support sampling on and around farms and screening samples at respective labs; (USU) 1 research scientist and 1 postdoctoral fellow to provide test reagents and contribute to data analysis. *Metrics of success*: selection of farms; study implementation with partners; human and animal sampling; sample screening using Luminex-based platform; data entry and analysis. *Deliverables*: wildlife, livestock and humans sampled on farms; questionnaires of farm workers conducted; samples tested. *Subtasks:* 2.5.1 collect livestock and wildlife (bat and nonhuman primate) samples 2.5.2 interview farm workers 2.5.3. collect blood samples from farm workers; 2.5.4. test serum samples 2.5.5 enter and analyze data.

Task 6. Disseminate reports to relevant stakeholders (Years 1, 3, OY5). *Description, execution, and resources*: same as Y1. *Metrics of success*. Same as Y1. *Deliverables*: same as Y1; *Subtasks*: 2.6.1-OY5.6.1 submit annual reports to DTRA. 2.6.2-OY5.6.2 submit annual report to local stakeholders. 2.6.3-OY5.6.3 presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review. 2.6.4-OY5.6.4 Conduct annual investigator meetings.

Year 3. Task 1: Continued: **Enhance Capacity within Malaysia to conduct serological surveillance for novel and known henipa- and filoviruses.** *Description, execution, and resources*: As in Y1. *Metrics of success*: See Y1 and Y2. *Deliverables*: Capacity built for serosurveillance in Malaysia and graduate student trained. *Subtasks*: 3.1.1. Grantee shall transfer any new henipa- and filovirus reagents to partner labs; 3.1.2. UM PhD or 2 Masters' students trained; 3.1.3. GoM lab personnel may train at USU

Task 2. Continued: Develop and validate new reagents to improve the Luminex-based panel for novel and known henipa- and filovirus antibody detection. *Description, execution, and resources:* as in Y1. *Metrics of success:* new reagents developed and validated that expand sero-platform; *Deliverable:* new reagents; *Subtasks:* 3.1.1 If novel henipa- or filoviruses are detected using molecular assays (testing done under PREDICT), grantee shall develop specific Luminex-based reagents for antibodies against these viruses and negative sera will be re-screened.

Task 4: Continued: Serological surveys of human, peridomestic animals and wildlife in indigenous communities that hunt. *Description, execution.* Follow-up study conducted with MoH as in Y1. *Resources*: as in Y1. *Metrics of success:* data analyzed (in concordance with UM study and PREDICT molecular data); *Deliverables*: repeat sampling in the same Orang Asli communities. *Subtasks*: 3.4.1 analyze serology data 3.4.2 evaluate serology along with molecular data from PREDICT, 3.4.3. Enter results into database; 3.4.4 share results with stakeholders.

Task 5. Continued: Serological study of farm workers, livestock, and wildlife around farms. *Description, execution.* Final analysis of farm study data; develop follow-up study (OY4) *resources:* Same as Y2. *Metrics of success*: results analyzed; manuscript drafted; report prepared for GoM partners *Deliverables*: final analysis; manuscript prepared for submission. *Subtasks:* 3.5.1 analyze qualitative and serological data from farm study 3.5.2 plan for follow-up study (if funded) 3.5.3 prepare report to GoM partners and stakeholders (farm owners).

Task 6. Disseminate reports to relevant stakeholders (Years 1, 3, OY5). *Description, execution, and resources*: same as Y1. *Metrics of success*. Same as Y1. *Deliverables*: same as Y1; *Subtasks*: 3.6.1-OY5.6.1 submit reports to DTRA. 3.6.2-OY5.6.2 Complete annual report to local stakeholders. 3.6.3, OY5.6.3 prepare manuscript for submission to a peer-reviewed publication. 3.6.4-OY5.6.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review. 3.6.5-OY5.6.5 Conduct annual stakeholder meetings.

Year 4 (Optional) Task 1: Continued: **Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses.** *Description, execution, and resources:* Select an additional Masters' student from UM to train (OY4-OY5). *Metrics of success*: See Y1 and Y2. *Deliverables*: Capacity built for serosurveillance in Malaysia and graduate students trained. *Subtasks*: 4.*1.2*. UM PhD student trained; additional Masters' student selected.

Task 2. Continued: Develop and validate new reagents to improve the Luminex-based panel for henipa- and filovirus antibody detection. *Description, execution, and resources:* as in Y1. *Metrics of success:* new regents developed and validated that expand sero-platform; *Deliverable:* new reagents; *Subtasks:* 4.1.1 If novel henipa- or filoviruses detected by PREDICT, develop specific Luminex-based reagents for these viruses and negative sera will be re-screened.

Task 4: Continued: Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. *Description, execution.* Complete test confirmation and data analysis with PREDICT PCR results. Re-screen sera, if necessary, using assays developed from newly discovered viruses. *Resources*: as in Y1. *Metrics of success* data analyzed along with results from UM study and PREDICT molecular data); *Deliverable*s: Comprehensive analysis of serological and molecular results. *Subtasks*: 4.4.1 complete confirmatory testing and analyze serology data; 4.4.2 evaluate serology along with molecular data from PREDICT, 4.4.3. Enter results into database; 2.4.4 Masters' student training; 4.4.5 share results with stakeholders.

Task 5. Continued: Serological study of farm workers, livestock, and wildlife around farms. (OY4-OY5) *Description and execution.* Follow-up study of same farms from Y2-3 to generate temporal data & detect change in seroprevalence. *Resources:* Same as Y2. *Metrics of success*: sampling with government partners; human and animal sampling; sample screening using Luminex-based platform; data entry and analysis. *Deliverables*: wildlife, livestock and humans sampled from same farms; questionnaires of farm workers repeated; samples tested & confirmed. *Subtasks:* 4.5.1 collect livestock samples4.5.2 collect wildlife samples 4.5.3 interview farm workers 4.5.4. sample farm workers; 4.5.5. test samples 4.5.6 enter and analyze data.

Year 5 (optional): Task 1: Continued: **Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses.** *Description, execution, and resources:* additional UM Masters' student trained. *Metrics of success*: See Y1 and Y2. *Deliverables*: Capacity built for serosurveillance in Malaysia enhanced and graduate students trained. Subtasks: 5.*1.1*. PhD student and Masters' student trained.

Task 2. Continued: Develop and validate new reagents to improve the Luminex-based panel for henipa- and filovirus antibody detection. *Description, execution, and resources:* as in Y1. *Metrics of success:* new regents developed and validated that expand sero-platform; *Deliverable:* new reagents; *Subtasks:* 5.1.1 If novel henipa- or filoviruses are detected using molecular assays (testing done under PREDICT), grantee shall develop specific Luminex-based reagents for antibodies against these viruses and negative sera will be re-screened.

Task 4: Continued: Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. (Y1, Y3). *Description, execution.* Data analysis from all years. *Resources*: as in Y1. *Metrics of success* data analyzed (in concordance with UM study and PREDICT molecular data); *Deliverables*: all serological data from Orang Asli study analyzed. *Subtasks*: 5.4.1 complete sample testing 5.4.2 analyze serology along with molecular data from PREDICT 5.4.3. Enter results into database; 5.4.5 share results with stakeholders.

Task 5. Continued: Follow-up study of farm workers, livestock, and wildlife around farms. (OY5) *Description and execution*: Continued sampling at farms. *Resources:* Same as OY4. *Metrics of success*: sampling with government partners; human and animal sampling; sample screening using Luminex-based platform; data entry and analysis. *Deliverables*: wildlife, livestock and humans sampled from same farms; questionnaires of farm workers; samples tested; longitudinal dataset analyzed. *Subtasks:* 5.5.1 collect livestock samples 5.5.2 collect wildlife (bat and macaque) samples 5.5.3 interview farm workers 5.5.4. Collect samples from farm workers; 5.5.5. Test serum samples 5.5.6 enter and analyze all farm data from Y2-OY5.

Task 6. Disseminate reports to relevant stakeholders (Years 1, 3, OY5). *Description, execution, and resources:* same as Y1. *Metrics of success*. Same as Y1. *Deliverables*: same as Y1; *Subtasks*: 5.6.1 submit final report to DTRA. 5.6.2 Final report to local stakeholders. 5.6.3 Prepare serological data analysis for publication a peer-reviewed journal. 5.6.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

PERFORMANCE SCHEDULE. (also in Statement of Work)

Task	Y1	Y2	Y3	OY4	OY5
1. Enhance capacity in Malaysia for serological surveillance for all henipaviruses and filoviruses					
1.1. Transfer BioRad Bio-Plex 200 in NPHL, DWNP, and UPM labs					
1.2 Transfer serological reagents to NPHL, DWNP, UPM, and UM labs					
1.3 Training staff at partner labs					
1.4 Identify graduate students at UM and UPM					
1.5 Convene Science Advisory Group					
1.6 Develop database for serology results and sample metadata					
1.7 Training in pseudovirus development at USU					
2. Develop & validate henipavirus and filovirus reagents.					
2.1 Produce specific henipavirus and filovirus proteins					
2.2 Produce and test monoclonal antibodies against new proteins					
2.3 Transfer henipa and filo N protein assays to partner labs					
2.4. develop/validate proteins and mAbs for novel henipa- & filoviruses					
3.Screen archived wildlife and Orang Asli sera					
3.1 Identify archived wildlife and human sera at NPHL and DWNP					
3.2 Screen sera using Luminex-based platform					
3.3 Confirm positive sera with additional testing					
3.4 Enter results in database / analyze					

Task	Y1	Y2	Y3	OY4	OY5
4. Sero-survey of Orang Asli and animals					
4.1 apply for IRB/IACUC approval					
4.2 Collect & test serum samples from Orang Asli – animals					
4.3 Enter results into database					
4.4 Confirm positive sera with additional testing					
4.5 Conduct follow-up study of Orang Asli and animals					
4.6 Analyze data					
5. Serological study of farm workers, livestock, and wildlife on farms	■	■	■	■	■
5.1 Apply for necessary permits and ethical approval	■	■			
5.2 scoping visits to potential study farms; select farms	■				
5.3 sample farm workers, livestock, and wildlife on farms		■	■		
5.4 follow-up study of farm workers, wildlife and livestock (4 farms)				■	■
5.5 Enter results into database / analyse results		■	■	■	■
6. Disseminate reports to relevant stakeholders					
6.1 annual report toDTRA					
6.2 annual report to government of Malaysia partners					
6.3 attend DTRA annual technical review					
6.4 partner meeting in Malaysia					
6.5 present results at scientific conference (e.g. ASTMH, IMED, ASM)					
6.6 prepare manuscripts for publication in peer-reviewed journal					

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RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 1** **Start Date:** 10/01/2016 **End Date:** 09/30/2017

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Jonathan	H	Epstein			2.00			22,700.00	7,105.10	29,805.10

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 29,805.10

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	8.00			33,750.00	10,563.75	44,313.75
1	Field Scientist	6.00			30,000.00	9,390.00	39,390.00
2	**Total Number Other Personnel**					**Total Other Personnel**	83,703.75

Total Salary, Wages and Fringe Benefits (A+B) 113,508.85

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Luminex 200 Machine ($66,500 each)	133,000.00
Luminex pro wash station ($10,600 per lab)	21,200.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 154,200.00

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,000.00
2.	Foreign Travel Costs	26,000.00
	Total Travel Cost	29,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	18,000.00
2.	Publication Costs	
3.	Consultant Services	5,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	403,118.78
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	426,118.78

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	722,827.63

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EHA Direct Costs	35.40	165,508.85	58,590.13
Subcontractual Indirect	35.40	100,000.00	35,400.00
	Total Indirect Costs		93,990.13

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	816,817.76

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1234 DTRA_Malaysia_EHABudgetJustificat | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 2** **Start Date:** 10/01/2017 **End Date:** 09/30/2018

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Jonathan	H	Epstein			2.00			23,835.00	7,460.36	31,295.36

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 31,295.36

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	8.00			35,437.50	11,091.94	46,529.44
1	Field Scientist	6.00			31,500.00	9,859.50	41,359.50
3	**Total Number Other Personnel**					**Total Other Personnel**	87,888.94

Total Salary, Wages and Fringe Benefits (A+B) 119,184.30

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Luminex 200 Machine ($66,500 each)	66,500.00
Luminex pro wash station ($10,600 per lab)	10,600.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 77,100.00

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,000.00
2.	Foreign Travel Costs	26,000.00
	Total Travel Cost	29,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	14,000.00
2.	Publication Costs	
3.	Consultant Services	5,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	481,327.70
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	500,327.70

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	725,612.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
RRA Direct Costs	35.40	167,184.29	59,183.24
Subcontractual Indirect	35.40	100,000.00	35,400.00
	Total Indirect Costs		94,583.24

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	820,195.24

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1234 DTRA_Malaysia_EIABudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 3** **Start Date:** 10/01/2018 **End Date:** 09/30/2019

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Jonathan	H	Epstein			2.00			25,026.75	7,833.37	32,860.12

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 32,860.12

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	9.00			37,209.38	11,646.53	48,855.91
1	Field Scientist	6.00			33,075.00	10,352.48	43,427.48

3 **Total Number Other Personnel**

Total Other Personnel 92,283.39

Total Salary, Wages and Fringe Benefits (A+B) 125,143.51

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,000.00
2.	Foreign Travel Costs	23,500.00
	Total Travel Cost	26,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,000.00
2.	Publication Costs	5,000.00
3.	Consultant Services	2,500.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	454,108.35
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	471,608.35

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	623,251.86

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EHA Direct Costs	35.40	169,143.51	59,876.80
Subcontractual Indirect	35.40	100,000.00	35,400.00
	Total Indirect Costs		95,276.80

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	718,528.66

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1234 DTRA_Malaysia_EHABudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period:** 4 **Start Date:** 10/01/2019 **End Date:** 09/30/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Jonathan	H	Epstein			2.00			26,278.09	8,225.04	34,503.13

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 34,503.13

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	9.00			39,069.84	12,228.86	51,298.70
1	Field Scientist	6.00			34,738.75	10,870.10	45,598.85

3 **Total Number Other Personnel**

Total Other Personnel 96,897.55

Total Salary, Wages and Fringe Benefits (A+B) 131,400.68

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,000.00
2.	Foreign Travel Costs	23,500.00
	Total Travel Cost	26,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,000.00
2.	Publication Costs	
3.	Consultant Services	2,500.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	463,418.22
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	475,918.22

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	633,818.90

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
MTA Direct Costs	35.40	170,400.68	60,321.84
Subcontractual Indirect	35.40	100,000.00	35,400.00
	Total Indirect Costs		95,721.84

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	729,540.74

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1234 DTRA_Malaysia_EIABudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 5** **Start Date:** 10/01/2020 **End Date:** 09/30/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Jonathan	H	Epstein			2.00			27,591.99	8,636.29	36,228.28

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 36,228.28

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.00			41,023.34	12,840.30	53,863.64
1	Field Scientist	6.00			36,465.19	11,413.60	47,878.79

3 **Total Number Other Personnel**

Total Other Personnel 101,742.43

Total Salary, Wages and Fringe Benefits (A+B) 137,970.71

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,000.00
2.	Foreign Travel Costs	23,500.00
	Total Travel Cost	26,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,000.00
2.	Publication Costs	5,000.00
3.	Consultant Services	2,500.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	399,699.07
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	417,199.07

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	581,669.78

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EHA Direct Costs	35.40	181,970.72	64,417.64
Subcontractual Indirect	35.40	100,000.00	35,400.00
	Total Indirect Costs		99,817.64

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	681,487.42

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1234 DTRA_Malaysia_EHABudgetJustificat

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		164,691.99
Section B, Other Personnel		462,516.06
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		627,208.05
Section C, Equipment		231,300.00
Section D, Travel		137,500.00
1. Domestic	15,000.00	
2. Foreign	122,500.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		2,291,172.12
1. Materials and Supplies	62,000.00	
2. Publication Costs	10,000.00	
3. Consultant Services	17,500.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	2,201,672.12	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		3,287,180.17
Section H, Indirect Costs		479,389.65
Section I, Total Direct and Indirect Costs (G + H)		3,766,569.82
Section J, Fee		

OMB Number: 4040-0001
Expiration Date: 6/30/2016

10 YEAR R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Instructions: On this form, you will attach the 10 Year R&R Subaward Budget files for your grant application. Complete the subawardee budget(s) in accordance with the 10 Year R&R budget instructions. Please remember that any files you attach must be a PDF document.

Click here to extract the 10 Year R&R Subaward Budget Attachment

Important: Please attach your subawardee budget file(s) with the file name of the subawardee organization. Each file name must be unique.

1) Please attach Attachment 1	DTRA_Malaysia_CMbudget.pdf		Delete Attachment	View Attachment
2) Please attach Attachment 2	DTRA_Malaysia_UPMbudget.pdf		Delete Attachment	View Attachment
3) Please attach Attachment 3	DTRA_Malaysia_NMRCAbudget.pdf		Delete Attachment	View Attachment
4) Please attach Attachment 4	DTRA_Malaysia_UJUSUbudget.pdf		Delete Attachment	View Attachment
5) Please attach Attachment 5		Add Attachment		
6) Please attach Attachment 6		Add Attachment		
7) Please attach Attachment 7		Add Attachment		
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 5344092560000 **Enter name of Organization:** Conservation Medicine, Ltd.

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 10/01/2016 **End Date:** 09/30/2017

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Thomas		Hughes						15,120.00	5,307.12	20,427.12

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 20,427.12

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.60			4,800.00	0.00	4,800.00
1	Microbiologist/Research Scientist	3.60			7,800.00	0.00	7,800.00
1	Research Scientist	3.60			7,090.00	0.00	7,090.00
1	Lab Technician	6.00			6,000.00	0.00	6,000.00
4	**Total Number Other Personnel**					**Total Other Personnel**	25,690.00

Total Salary, Wages and Fringe Benefits (A+B) 46,117.12

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,000.00
2.	Foreign Travel Costs	
	Total Travel Cost	5,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	23,120.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	23,120.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	74,237.12

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
CX Indirect Costs	10.00	74,237.12	7,423.71
		Total Indirect Costs	7,423.71

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	81,660.83

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1240 DTRA_Malaysia_CMbudgetJustificati | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 5344092560000 **Enter name of Organization:** Conservation Medicine, Ltd.

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 10/01/2017 **End Date:** 09/30/2018

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Thomas		Hughes			3.60			15,876.00	5,572.48	21,448.48

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 21,448.48

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.60			4,800.00	0.00	4,800.00
1	Microbiologist/Research Scientist	3.60			8,190.00	0.00	8,190.00
1	Research Scientist	3.60			7,302.70	0.00	7,302.70
1	Lab Technician	6.00			6,000.00	0.00	6,000.00
4	**Total Number Other Personnel**					**Total Other Personnel**	26,292.70

Total Salary, Wages and Fringe Benefits (A+B) 47,741.18

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,000.00
2.	Foreign Travel Costs	
	Total Travel Cost	5,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	44,500.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	44,500.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	97,241.18

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
CM Indirect Costs	10.00	97,241.18	9,724.12
		Total Indirect Costs	9,724.12

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	106,965.30

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1240 DTRA_Malaysia_CMbudgetJustificati

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 5344092560000 **Enter name of Organization:** Conservation Medicine, Ltd.

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 10/01/2018 **End Date:** 09/30/2019

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Thomas		Hughes			3.60			16,689.80	5,831.10	22,520.90

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 22,520.90

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.60			4,800.00	0.00	4,800.00
1	Microbiologist/Research Scientist	3.60			8,599.50	0.00	8,599.50
1	Research Scientist	3.60			7,521.78	0.00	7,521.78
1	Lab Technician	6.00			6,000.00	0.00	6,000.00

4 **Total Number Other Personnel**

Total Other Personnel 26,921.28

Total Salary, Wages and Fringe Benefits (A+B) 49,442.18

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,000.00
2. Foreign Travel Costs	
Total Travel Cost	5,000.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	41,500.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	41,500.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	95,942.18

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
CM Indirect Costs	10.00	95,942.18	9,594.22
		Total Indirect Costs	9,594.22

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	105,536.40

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1240 DTRA_Malaysia_CMbudgetJustificati

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 5344092560000 **Enter name of Organization:** Conservation Medicine, Ltd.

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 10/01/2019 **End Date:** 09/30/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Thomas		Hughes			3.60			17,503.23	6,143.65	23,646.94

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 23,646.94

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.60			4,800.00	0.00	4,800.00
1	Microbiologist/Research Scientist	3.60			9,029.48	0.00	9,029.48
1	Research Scientist	3.60			7,747.43	0.00	7,747.43
1	Lab Technician	6.00			6,000.00	0.00	6,000.00
4	**Total Number Other Personnel**					**Total Other Personnel**	27,576.91

Total Salary, Wages and Fringe Benefits (A+B) 51,223.85

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,000.00
2.	Foreign Travel Costs	
	Total Travel Cost	5,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	40,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	40,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	96,223.85

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
CM Indirect Costs	10.00	96,223.85	9,622.39
		Total Indirect Costs	9,622.39

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	105,846.24

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1240 DTRA_Malaysia_CMbudgetJustificati

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 5344092560000 **Enter name of Organization:** Conservation Medicine, Ltd.

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 10/01/2020 **End Date:** 09/30/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Thomas		Hughes			3.60			18,370.45	6,458.84	24,829.29

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 24,829.29

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	3.60			4,800.00	0.00	4,800.00
1	Microbiologist/Research Scientist	3.60			9,480.95	0.00	9,480.95
1	Research Scientist	3.60			7,979.86	0.00	7,979.86
1	Lab Technician	6.00			6,000.00	0.00	6,000.00
4	**Total Number Other Personnel**					**Total Other Personnel**	28,260.81

Total Salary, Wages and Fringe Benefits (A+B) 53,090.10

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,000.00
2. Foreign Travel Costs	
Total Travel Cost	5,000.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	29,380.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	29,380.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	87,470.10

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
CX Indirect Costs	10.00	87,470.10	8,747.01
		Total Indirect Costs	8,747.01

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	96,217.11

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1240 DTRA_Malaysia_CMbudgetJustificati

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		112,872.73
Section B, Other Personnel		134,741.70
Total Number Other Personnel	20	
Total Salary, Wages and Fringe Benefits (A+B)		247,614.43
Section C, Equipment		
Section D, Travel		25,000.00
1. Domestic	25,000.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		178,500.00
1. Materials and Supplies	178,500.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		451,114.43
Section H, Indirect Costs		45,111.45
Section I, Total Direct and Indirect Costs (G + H)		496,225.88
Section J, Fee		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 652210832000O **Enter name of Organization:** Universiti Putra Malaysia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 10/01/2016 **End Date:** 09/30/2017

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Latiffah		Hassan			2.00			5,000.00	0.00	5,000.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 5,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
1	Graduate Students				12,000.00	0.00	12,000.00
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Technician				600.00	0.00	600.00

2 **Total Number Other Personnel**

Total Other Personnel 12,600.00

Total Salary, Wages and Fringe Benefits (A+B) 17,600.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,000.00
2.	Foreign Travel Costs	0.00
	Total Travel Cost	6,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	23,600.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
UPX Indirect Rate	21.00	23,600.00	4,956.00
		Total Indirect Costs	4,956.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	28,556.00

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1241-DTRA_Malaysia_UPMbudgetJustificat | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 652210832000O **Enter name of Organization:** Universiti Putra Malaysia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 10/01/2017 **End Date:** 09/30/2018

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Lailiah		Hassan			2.00			5,000.00	0.00	5,000.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 5,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
1	Graduate Students				12,000.00	0.00	12,000.00
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Technician				7,200.00	0.00	7,200.00
2	**Total Number Other Personnel**					**Total Other Personnel**	19,200.00

Total Salary, Wages and Fringe Benefits (A+B) 24,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,000.00
2.	Foreign Travel Costs	0.00
	Total Travel Cost	6,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	30,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
UPX Indirect Rate	21.00	30,200.00	6,342.00
		Total Indirect Costs	6,342.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	36,542.00

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1241-DTRA_Malaysia_UPMbudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 652210832000O **Enter name of Organization:** Universiti Putra Malaysia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 10/01/2018 **End Date:** 09/30/2019

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Lailiah		Hassan			2.00			5,000.00	0.00	5,000.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 5,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
1	Graduate Students				12,000.00	0.00	12,000.00
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Technician				7,200.00	0.00	7,200.00

2 **Total Number Other Personnel**

Total Other Personnel 19,200.00

Total Salary, Wages and Fringe Benefits (A+B) 24,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,000.00
2.	Foreign Travel Costs	0.00
	Total Travel Cost	6,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	30,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
UPX Indirect Rate	21.00	30,200.00	6,342.00
		Total Indirect Costs	6,342.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	36,542.00

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1241-DTRA_Malaysia_UPMbudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 652210832000O **Enter name of Organization:** Universiti Putra Malaysia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 10/01/2019 **End Date:** 09/30/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Latiffah		Hassan			2.00			5,000.00	0.00	5,000.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 5,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
1	Graduate Students				12,000.00	0.00	12,000.00
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Technician				7,200.00	0.00	7,200.00
2	**Total Number Other Personnel**					**Total Other Personnel**	19,200.00

Total Salary, Wages and Fringe Benefits (A+B) 24,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,000.00
2.	Foreign Travel Costs	0.00
	Total Travel Cost	6,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	30,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
UPX Indirect Rate	21.00	30,200.00	6,342.00
		Total Indirect Costs	6,342.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	36,542.00

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1241-DTRA_Malaysia_UPMbudgetJustificat

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 652210832000O **Enter name of Organization:** Universiti Putra Malaysia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 10/01/2020 **End Date:** 09/30/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Lailiah		Hassan			2.00			5,000.00	0.00	5,000.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 5,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
1	Graduate Students				12,000.00	0.00	12,000.00
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Technician				7,200.00	0.00	7,200.00

2 **Total Number Other Personnel**

Total Other Personnel 19,200.00

Total Salary, Wages and Fringe Benefits (A+B) 24,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,000.00
2.	Foreign Travel Costs	0.00
	Total Travel Cost	6,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	30,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
UPX Indirect Rate	21.00	30,200.00	6,342.00
		Total Indirect Costs	6,342.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	36,542.00

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1241-DTRA_Malaysia_UPMbudgetJustificat

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		25,000.00
Section B, Other Personnel		89,400.00
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		114,400.00
Section C, Equipment		
Section D, Travel		30,000.00
1. Domestic	30,000.00	
2. Foreign	0.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		144,400.00
Section H, Indirect Costs		30,324.00
Section I, Total Direct and Indirect Costs (G + H)		174,724.00
Section J, Fee		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 042958954000 **Enter name of Organization:** Naval Medical Research Center Asia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 10/01/2016 **End Date:** 09/30/2017

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Brian		Pike			2.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,160.00
	Total Travel Cost	3,160.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	45,000.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	45,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	48,160.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
NMRCA Indirect Costs			1,840.34
		Total Indirect Costs	1,840.34

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,000.34

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1242-DTRA_Malaysia_NMRCAJustification. | | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 042958954000 **Enter name of Organization:** Naval Medical Research Center Asia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 10/01/2017 **End Date:** 09/30/2018

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Brian		Pike			2.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,160.00
	Total Travel Cost	3,160.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	45,000.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	45,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	48,160.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
NMRCA Indirect Costs			1,840.34
		Total Indirect Costs	1,840.34

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,000.34

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1242-DTRA_Malaysia_NMRCAJustification.

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 042958954000 **Enter name of Organization:** Naval Medical Research Center Asia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 10/01/2018 **End Date:** 09/30/2019

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Brian		Pike			2.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,160.00
	Total Travel Cost	3,160.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	45,000.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	45,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	48,160.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
NMRCA Indirect Costs			1,840.34
		Total Indirect Costs	1,840.34

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,000.34

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1242-DTRA_Malaysia_NMRCAJustification.

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 042958954000 **Enter name of Organization:** Naval Medical Research Center Asia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 10/01/2019 **End Date:** 09/30/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Brian		Pike			2.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,160.00
	Total Travel Cost	3,160.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	45,000.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	45,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	48,160.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
NMRCA Indirect Costs			1,840.34
		Total Indirect Costs	1,840.34

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,000.34

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1242-DTRA_Malaysia_NMRCAJustification.

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 042958954000 **Enter name of Organization:** Naval Medical Research Center Asia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 10/01/2020 **End Date:** 09/30/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Brian		Pike			2.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,160.00
	Total Travel Cost	3,160.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	45,000.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	45,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	48,160.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
NMRCA Indirect Costs			1,840.34
		Total Indirect Costs	1,840.34

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,000.34

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1242-DTRA_Malaysia_NMRCAJustification.

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals ($)	
Section A, Senior/Key Person		0.00
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		0.00
Section C, Equipment		
Section D, Travel		15,800.00
1. Domestic		
2. Foreign	15,800.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		225,000.00
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	225,000.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		240,800.00
Section H, Indirect Costs		9,201.70
Section I, Total Direct and Indirect Costs (G + H)		250,001.70
Section J, Fee		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 144676566000 **Enter name of Organization:** The Henry M. Jackson Foundation at USUHS

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 1** **Start Date:** 10/01/2016 **End Date:** 09/30/2017

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Christopher		Broder			1.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			48,000.00	15,513.60	63,513.60
1	Graduate Students	6.00			25,243.00	8,410.97	33,653.97
	Undergraduate Students						
1	Secretarial/Clerical	6.00			17,800.00	5,752.96	23,552.96

3 **Total Number Other Personnel**

Total Other Personnel 120,720.53

Total Salary, Wages and Fringe Benefits (A+B) 120,720.53

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	10,000.00
	Total Travel Cost	10,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	27,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	27,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	157,720.53

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EJF USO Direct Costs	54.74	157,720.53	85,181.42
		Total Indirect Costs	85,181.42

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	242,901.95

J. Fee

	Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1243-DTRA_Malaysia_IUFUSUjustification | | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 144676566000 **Enter name of Organization:** The Henry M. Jackson Foundation at USUHS

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 10/01/2017 **End Date:** 09/30/2018

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Christopher		Broder			1.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			49,440.00	15,979.01	65,419.01
1	Graduate Students	6.00			26,000.29	8,663.30	34,663.59
	Undergraduate Students						
1	Secretarial/Clerical	6.00			17,801.00	5,753.28	23,554.28

3 **Total Number Other Personnel**

Total Other Personnel 123,636.88

Total Salary, Wages and Fringe Benefits (A+B) 123,636.88

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	20,000.00
	Total Travel Cost	20,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	43,250.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	43,250.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	186,886.88

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EJF USO Direct Costs	34.74	186,886.88	100,933.53
	Total Indirect Costs		100,933.53

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	287,820.41

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1243-DTRA_Malaysia_IUFUSUjustification

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 144676566000 **Enter name of Organization:** The Henry M. Jackson Foundation at USUHS

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 10/01/2018 **End Date:** 09/30/2019

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Christopher		Broder			1.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			50,933.00	16,458.38	67,391.38
1	Graduate Students	6.00			26,780.30	8,923.20	35,703.50
	Undergraduate Students						
1	Secretarial/Clerical	6.00			17,802.00	5,753.61	23,555.61

3 **Total Number Other Personnel**

Total Other Personnel 126,640.69

Total Salary, Wages and Fringe Benefits (A+B) 126,640.69

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	16,500.00
	Total Travel Cost	16,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	27,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	27,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	170,140.69

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
MTF OSD Direct Costs	54.74	170,140.69	91,889.27
		Total Indirect Costs	91,889.27

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	262,029.96

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1243-DTRA_Malaysia_IUFUSUjustification

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 144676566000 **Enter name of Organization:** The Henry M. Jackson Foundation at USUHS

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 10/01/2019 **End Date:** 09/30/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Christopher		Broder			1.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			52,450.90	16,952.13	69,403.03
1	Graduate Students	6.00			27,583.71	9,190.89	36,774.60
	Undergraduate Students						
1	Secretarial/Clerical	6.00			17,803.00	5,753.93	23,556.93

3 **Total Number Other Personnel**

Total Other Personnel 129,734.56

Total Salary, Wages and Fringe Benefits (A+B) 129,734.56

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	10,000.00
	Total Travel Cost	10,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	36,250.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	36,250.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	175,984.56

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EJF USO Direct Costs	54.74	175,984.56	95,045.42
		Total Indirect Costs	95,045.42

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	271,029.98

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1243-DTRA_Malaysia_IUFUSUjustification

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 6/30/2016

ORGANIZATIONAL DUNS: 144676566000 **Enter name of Organization:** The Henry M. Jackson Foundation at USUHS

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 10/01/2020 **End Date:** 09/30/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Christopher		Broder			1.00			0.00	0.00	0.00

Project Role: PD/PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			54,024.42	17,460.69	71,485.11
1	Graduate Students	6.00			28,411.22	9,466.62	37,877.84
	Undergraduate Students						
	Secretarial/Clerical						

2 **Total Number Other Personnel**

Total Other Personnel 109,362.95

Total Salary, Wages and Fringe Benefits (A+B) 109,362.95

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	11,500.00
	Total Travel Cost	11,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	20,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	20,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	140,862.95

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
EJF USO Direct Costs	54.74	140,862.95	76,077.01
		Total Indirect Costs	76,077.01

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	216,939.96

J. Fee

Funds Requested ($)

K. Budget Justification

(Only attach one file.) 1243-DTRA_Malaysia_IUFUSUjustification

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		0.00
Section B, Other Personnel		610,095.61
Total Number Other Personnel	14	
Total Salary, Wages and Fringe Benefits (A+B)		610,095.61
Section C, Equipment		
Section D, Travel		68,000.00
1. Domestic		
2. Foreign	68,000.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		153,500.00
1. Materials and Supplies	153,500.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		831,595.61
Section H, Indirect Costs		449,126.65
Section I, Total Direct and Indirect Costs (G + H)		1,280,722.26
Section J, Fee		

EcoHealth Alliance (EHA): Y1

PI Salary. PI Epstein will commit 2 months p.a. (Y1-OY5). In Year 1, we will request $22,700 salary for 2.0 months p.a. PI Epstein will meet with Co-PIs and key personnel in Malaysia to initiate the project and coordinate the wide array of partners involved in this collaboration. He will oversee the start of the training workshop at Government of Malaysia (GoM) labs. He will attend the DTRA Annual Technical Review.

Other Personnel. The Program Administrator, Emma Lane, will commit 8.0 months p.a. (Y1-OY5) to this project. In Year 1, we will request $33,750 for 8.0 months p.a. Lane will assist with communication among collaborators, reporting to DTRA and local GoM partners, the hiring of the project field scientist and additional team members, and the logistics of travel for the PIs, KPs, and all team members. We will hire a project field scientist for 6.0 months p.a. (Y1-OY5) starting at $30,000. The field scientist will work with the in-country team in Malaysia to assist with fieldwork, sample collection, and will be located in KL and field sites throughout Malaysia as needed.

Fringe Benefits. Fringe benefits are calculated at 31.3% of base salary for PI Epstein, Program Administrator Lane and Field Scientist. Base salaries increase at a yearly percentage rate of 5.0%.

Equipment. We will purchase three Luminex 200 machines at $66,500 each (Y1-OY5). In Year 1, we will purchase two Luminex 200 machines (for NPHL and DNWP) for a total of $133,000.00. The third may be purchased in Y2 for VRI. We will purchase 3 Luminex pro wash stations at $10,600 per lab (DWNP, NPHL, and VRI) (Y1-OY5). In Year 1, we will purchase two Luminex pro wash stations for a total of $21,200.00. The Luminex machines and pro wash stations are necessary for conducting the core serological assays for henipaviruses and filoviruses and represent our major deliverable for enhancing Malaysia's surveillance capabilities.

Travel.
Domestic. We have budgeted PI domestic travel for Y1-OY5 for $3,000 per year. Travel will include transportation costs to and from 1 scientific conference (e.g. ASTMH, ASM Biodefense) in the US and the annual DTRA meeting to present preliminary results. Each trip is budgeted for $1,500 ($320 train RT + $1,180 ($295*4 days)).

International. We have budgeted international travel for Y1 at $26,000. PI travel to Malaysia for Y1-OY5 to meet with co-investigators and government collaborators, participate in lab training, meet with graduate students, is estimated at $6,000 per year; ($2,500 airfare NY-KL RT, + $2,630 ($263*10 days) accommodation, dining and incidentals + $870 (transportation to regions for site visits, meetings, and misc. travel costs). The field scientist will travel to Malaysia twice per year for one month's time for Y1-OY5 for $15,000 per year. We estimate each trip to be $7,500 ($2,500 airfare + $2,000 ($80*25 field days) + $789 ($263*3 days in Kuala Lumpur for meetings) + $2,000 rental vehicle to transport at field sites + $211 misc. travel costs. We have budgeted travel for consultant Gary Crameri to travel to Malaysia to trouble shoot Luminex assays and conduct training workshops in Y1 and Y2. In Year 1, Crameri will travel to the National Public Health Lab and Department of Wildlife and National Parks in Kuala Lumpur

from Australia. We request S5,000 in Y1 ($1,300 airfare + $3,682 (S263*14 days in KL) + $20 misc. travel costs.

Other Direct Costs.
Materials and Supplies. We will purchase three microplate shakers at S1,000 per lab and three laptops for Luminex reads at S3,000 each (Y1-OY5). In Year 1, we will purchase two microplate shakers for a total of $2,000.00 and two laptops for Luminex reads for a total of $6,000.00. We estimate costs for supplies, consumables, and shipping costs at S5,000 per year for Y1-OY5 and phone/conference call charges at $5,000 per year for Y1-OY5.

Consultant Services. We will hire Gary Crameri as a consultant on the project (Y1-OY5) for a total of $25,000.00 to co-conduct lab trainings, troubleshoot Luminex assays, and to contribute to study design and data analysis and publication. In Year 1, Crameri's consultancy agreement will be $5,000.

Subawards/Consortium/Contractual Costs. We will have three subaward agreements on this project (Y1-OY5). In Year 1, Conservation Medicine Ltd. Subaward will total S81,660.83, The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences subaward will total $242,901.95, the United States Navy subaward will total S50,000.00, and the Universiti Putra Malaysia subaward will total $28,556.00. Further details on budget elements are outlined under the subaward budget documentation.

Indirect Costs. We are requesting the federally agreed indirect cost of 35.4% on all direct costs. We have applied this IC rate to the first S25,000 of the subcontracts valued over S25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y1: S93,990.13.

EcoHealth Alliance (EHA) Y2:

PI Salary. All salaries are increased by 1.05% p.a. due to the exceptionally high cost of living increases in New York City. In Year 2, we will request $23,835 salary for 2.0 months p.a. PI Epstein will meet with Co-PIs, key personnel, government partners, and graduate students in Malaysia, and coordinate the wide array of partners involved in this collaboration. He will work on study development, ethical review applications, and coordinate project activities. He will attend the DTRA Annual Technical Review.

Other Personnel. The Program Administrator, Emma Lane, will commit 8.0 months p.a. (Y1-OY5) to this project. In Year 2, we will request $35.437.50 for 8.0 months p.a. Lane will assist with communication among collaborators, reporting to DTRA and local GoM partners, the hiring of the project field scientist and additional team members, and the logistics of travel for the PIs, KPs, and all team members. In Year 2, we request S31,500 for 6.0 months p.a. for the project field scientist. The field scientist will work with CM and GoM partners for 2 months in Malaysia and 4 months in NY p.a. to help develop and implement field studies, obtain ethical approvals, coordinate supplies and logistics, perform data analysis. He/she will be located in NY and Malaysia.

Fringe Benefits. Fringe benefits are calculated at 31.3% of base salary for PI Epstein, Program Administrator Lane, and Field Scientist. Base salaries increase at a yearly percentage rate of 5.0%.

Equipment. In Year 2, we will purchase one Luminex 200 machine for a total of $66,500.00 and one Luminex pro wash station for a total of $10,600.00 for the Veterinary Research Institute (VRI), our third GoM partner. The Luminex machines and pro wash stations are necessary for conducting the core serological assays for henipaviruses and filoviruses and represent our major deliverable for enhancing Malaysia's surveillance capabilities.

Domestic. We have budgeted PI domestic travel for Y1-OY5 for $3,000 per year. Travel will include transportation costs to and from 1 scientific conference (e.g. ASTMH, ASM Biodefense) in the US and the annual DTRA meeting to present preliminary results. Each trip is budgeted for $1,500 ($320 train RT + $1,180 ($295*4 days)).

International. We have budgeted international travel for Y2 at $26,000. PI travel to Malaysia to meet with co-investigators and government collaborators, participate in lab training, meet with graduate students, is estimated at $6,000 per year; ($2,500 airfare NY-KL RT, + $2,630 ($263*10 days) accommodation, dining and incidentals + $870 (transportation to regions for site visits, meetings, and misc. travel costs). The field scientist will travel to Malaysia twice per year for one month's time for Y1-OY5 for $15,000 per year. *We estimate each trip to be $7,500 ($2,500 airfare + $2,000 ($80*25 field days) + $789 ($263*3 days in Kuala Lumpur for meetings) + $2,000 rental vehicle to transport at field sites + $211 misc. travel costs.* In Y2, we have budgeted for consultant Gary Crameri to travel to Malaysia from Australia to conduct a 10-day training workshop at the Veterinary Research Institute in Ipoh and attend the annual co-investigators' meeting in KL. We request $5,000 in Y2 ($1,500 airfare + $2756 ($263*4 days in KL and $142*12 days in Ipoh) + $744 misc. travel costs incl. car rental.

Other Direct Costs.
Materials and Supplies. We will purchase three microplate shakers at $1,000 per lab and three laptops for Luminex reads at $3,000 each (Y1-OY5). In Year 2, we will purchase one microplate shaker for a total of $1,000.00 and one laptop for Luminex reads for a total of $3,000.00. We estimate shipping costs for supplies and consumables at $5,000 per year for Y1-OY5 and phone/conference call charges at $5,000 per year for Y1-OY5.

Consultant Services. In Year 2, Crameri's consultancy agreement will be $5,000 to co-conduct lab trainings, troubleshoot Luminex assays, and to contribute to study design and data analysis and publication.

Subawards/Consortium/Contractual Costs. We will have three subaward agreements on this project (Y1-OY5). In Year 2, Conservation Medicine Ltd. Subaward will total $106,965.29, Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences subaward will total $287,820.41, the United States Navy subaward will total $50,000.00, and the Universiti Putra Malaysia subaward will total $36,542.00. Further details on budget elements are outlined under the subaward budget documentation.

Indirect Costs. We are requesting the federally agreed indirect cost of 35.4% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y2: $94,583.24.

EcoHealth Alliance (EHA) Y3:
PI Salary. All salaries are increased by 1.05% p.a. due to the exceptionally high cost of living increases in New York City. In Year 3, we will request $25,026.75 salary for 2.0 months p.a. PI Epstein will meet with Co-PIs, key personnel, government partners, and graduate students in Malaysia, and coordinate the wide array of partners involved in this collaboration. He will work on comprehensive data analysis for Y1-3, the final summary report to DTRA and local stakeholders and will coordinate project activities for OY 4 and OY5 (if funded). He will attend the DTRA Annual Technical Review.

Other Personnel. The Program Administrator, Emma Lane, will commit 8.0 months p.a. (Y1-OY5) to this project. In Year 3, we will request $37,209.38 for 8.0 months p.a. Lane will assist with communication among collaborators, reporting to DTRA and local GoM partners, and logistics of travel for the PIs, KPs, and all team members. In Year 3, we request $33,075.00 for 6.0 months p.a. for the project field scientist. The field scientist will work with CM and GoM partners for 2 months in Malaysia and 4 months in NY p.a. to help develop and implement field studies, obtain ethical approvals, coordinate supplies and logistics, contribute to data analysis and reporting. He/she will be located in NY and Malaysia.

Fringe Benefits. Fringe benefits are calculated at 31.3% of base salary for PI Epstein, Program Administrator Lane, and Field Scientist. Base salaries increase at a yearly percentage rate of 5.0%.

Equipment. N/A

Travel.
Domestic. We have budgeted PI domestic travel for Y1-OY5 for $3,000 per year. Travel will include transportation costs to and from 1 scientific conference (e.g. ASTMH, ASM Biodefense) in the US and the annual DTRA meeting to present preliminary results. Costs per trip may vary, as per diem rates will be used for the meeting location.

International. We have budgeted international travel for Y3 at $26,000. PI travel to Malaysia to meet with co-investigators and government collaborators, participate in lab training, meet with graduate students, is estimated at $6,000 per year; ($2,500 airfare NY-KL RT, + $2,630 ($263*10 days) accommodation, dining and incidentals + $870 (transportation to regions for site visits, meetings, and misc. travel costs). The field scientist will travel to Malaysia twice per year for one month's time for Y1-OY5 for $15,000 per year. We estimate each trip to be $7,500 ($2,500 airfare + $2,000 ($80*25 field days) + $789 ($263*3 days in Kuala Lumpur for meetings) + $2,000 rental vehicle to transport at field sites + $211 misc. travel costs. Consultant Crameri will travel from Australia to KL for the annual Co-PIs meeting: $2,500 ($1300 RT airfare + $1,052 ($263*4) days in Kuala Lumpur) + $148 misc. travel expenses.

Other Direct Costs.
Materials and Supplies. We estimate shipping costs for supplies and consumables at $5,000 per year for Y1-OY5 and phone/conference call charges at $5,000 per year for Y1-OY5.

Publications. We request $10,000 for publication costs for Y3 and OY5. In Year 3, we request $5,000.

Consultant Services. In Year 3, Crameri's consultancy agreement will be $2,500 to contribute to study design and data analysis, reporting and publication.

Subawards/Consortium/Contractual Costs. We will have three subaward agreements on this project (Y1-OY5). In Year 3, Conservation Medicine Ltd. Subaward will total $105,536.40, Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences subaward will total $262,029.95, the United States Navy subaward will total $50,000.00, and the Universiti Putra Malaysia subaward will total $36,542.00. Further details on budget elements are outlined under the subaward budget documentation.

Indirect Costs. We are requesting the federally agreed indirect cost of 35.4% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for Y3: $95,276.80.

EcoHealth Alliance (EHA) Option Year 4 (OY4):

PI Salary. All salaries are increased by 1.05% p.a. due to the exceptionally high cost of living increases in New York City. In OY4, we will request $26,278.09 salary for 2.0 months p.a. PI Epstein will meet with Co-PIs, key personnel, government partners, and graduate students in Malaysia, and coordinate the wide array of partners involved in this collaboration. He will work on study development, ethical review applications, and coordinate project activities. He will attend the DTRA Annual Technical Review.

Other Personnel. The Program Administrator, Emma Lane, will commit 8.0 months p.a. (Y1-OY5) to this project. In OY4, we will request $38,069.84 for 8.0 months p.a. Lane will assist with communication among collaborators, reporting to DTRA and local GoM partners, the hiring of the project field scientist and additional team members, and the logistics of travel for the PIs, KPs, and all team members. In OY4, we request $34,728.75 for 6.0 months p.a. for the project field scientist. The field scientist will work with CM and GoM partners for 2 months in Malaysia and 4 months in NY p.a. to help develop and implement field studies, obtain ethical approvals, coordinate supplies and logistics, contribute to data analysis and reporting. He/she will be located in NY and Malaysia.

Fringe Benefits. Fringe benefits are calculated at 31.3% of base salary for PI Epstein, Program Administrator Lane, and Field Scientist. Base salaries increase at a yearly percentage rate of 5.0%.

Equipment. N/A

Travel.
Domestic. We have budgeted PI domestic travel for Y1-OY5 for $3,000 per year. Travel will include transportation costs to and from 1 scientific conference (e.g. ASTMH, ASM Biodefense) in the US and the annual DTRA meeting to present preliminary results. Costs per trip may vary, as per diem rates will be used for the meeting location.

International. We have budgeted international travel for OY4 at $26,000. PI travel to Malaysia to meet with co-investigators and government collaborators, participate in lab training, meet with graduate students, is estimated at $6,000 per year; ($2,500 airfare NY-KL RT, + $2,630 ($263*10 days) accommodation, dining and incidentals + $870 (transportation to regions for site visits, meetings, and misc. travel costs). The field scientist will travel to Malaysia twice per year for one month's time for Y1-OY5 for $15,000 per year. We estimate each trip to be $7,500 ($2,500 airfare + $2,000 ($80*25 field days) + $789 ($263*3 days in Kuala Lumpur for meetings) + $2,000 rental vehicle to transport at field sites + $211 misc. travel costs. Consultant Crameri will travel from Australia to KL for the annual Co-PIs meeting: $2,500 ($1300 RT airfare + $1,052 ($263*4) days in Kuala Lumpur) + $148 misc. travel expenses.

Other Direct Costs.
Materials and Supplies. We estimate costs for supplies and consumables at $5,000 per year for Y1-OY5 and phone/conference call charges at $5,000 per year for Y1-OY5.

Consultant Services. In OY4, Crameri's consultancy agreement will be $2,500 to contribute to study design and data analysis and publication.

Subawards/Consortium/Contractual Costs. We will have three subaward agreements on this project (Y1-OY5). In OY4, Conservation Medicine Ltd. Subaward will total $105,846.24, Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences subaward will total $271,029.98, the United States Navy subaward will total $50,000.00, and the Universiti Putra Malaysia subaward will total $36,542.00. Further details on budget elements are outlined under the subaward budget documentation.

Indirect Costs. We are requesting the federally agreed indirect cost of 35.4% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for OY4: $95,721.84.

EcoHealth Alliance (EHA) OY5:

PI Salary. All salaries are increased by 1.05% p.a. due to the exceptionally high cost of living increases in New York City. In OY5, we will request $27,591.99 salary for 2.0 months p.a. PI Epstein will meet with Co-PIs, key personnel, government partners, and graduate students in Malaysia, and coordinate the wide array of partners involved in this collaboration. He will work on final data analysis, final report to DTRA and local stakeholders and coordinate project activities. He will attend the DTRA Annual Technical Review.

Other Personnel. The Program Administrator, Emma Lane, will commit 8.0 months p.a. (Y1-OY5) to this project. In OY5, we will request S41,023.34 for 8.0 months p.a. Lane will assist with communication among collaborators, reporting to DTRA and local GoM partners, the hiring of the project field scientist and additional team members, and the logistics of travel for the PIs, KPs, and all team members. In OY5, we request $36,465.19 for 6.0 months p.a. for the project field scientist. The field scientist will work with CM and GoM partners for 2 months in Malaysia and 4 months in NY p.a. to help develop and implement field studies, obtain ethical approvals, coordinate supplies and logistics, contribute to data analysis and reporting. He/she will be located in NY and Malaysia.

Fringe Benefits. Fringe benefits are calculated at 31.3% of base salary for PI Epstein, Program Administrator Lane, and Field Scientist. Base salaries increase at a yearly percentage rate of 5.0%.

Equipment. N/A

Travel.
Domestic. We have budgeted PI domestic travel for Y1-OY5 for $3,000 per year. Travel will include transportation costs to and from 1 scientific conference (e.g. ASTMH, ASM Biodefense) in the US and the annual DTRA meeting to present preliminary results. Costs per trip may vary, as per diem rates will be used for the meeting location.

International. We have budgeted international travel for Y3 at $26,000. PI travel to Malaysia to meet with co-investigators and government collaborators, participate in lab training, meet with graduate students, is estimated at $6,000 per year; (S2,500 airfare NY-KL RT, + S2,630 (S263*10 days) accommodation, dining and incidentals + $870 (transportation to regions for site visits, meetings, and misc. travel costs). The field scientist will travel to Malaysia twice per year for one month's time for Y1-OY5 for $15,000 per year. We estimate each trip to be S7,500 (S2,500 airfare + $2,000 (S80*25 field days) + S789 ($263*3 days in Kuala Lumpur for meetings) + $2,000 rental vehicle to transport at field sites + $200 misc. travel costs. Consultant Crameri will travel from Australia to KL for the annual Co-PIs meeting: $2,500 (S1300 RT airfare + $1,052 ($263*4) days in Kuala Lumpur) + $148 misc. travel expenses.

Other Direct Costs.
Materials and Supplies. We estimate shopping costs for supplies and consumables at S5,000 per year for Y1-OY5 and phone/conference call charges at $5,000 per year for Y1-OY5.

Publications. In OY5, we request S5,000 for publication of scientific manuscripts.

Consultant Services. In OY5, Crameri's consultancy agreement will be S2,500 to contribute to final data analysis and publication.

Subawards/Consortium/Contractual Costs. We will have three subaward agreements on this project (Y1-OY5). In OY4, Conservation Medicine Ltd. Subaward will total $96,217.11, Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences subaward will total S216,939,96, the United States Navy subaward will total S50,000.00, and the Universiti

Putra Malaysia subaward will total $36542. Further details on budget elements are outlined under the subaward budget documentation.

Indirect Costs. We are requesting the federally agreed indirect cost of 35.4% on all direct costs. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. Total EcoHealth Alliance budgeted indirect costs for OY5: $99,817.63.

Conservation Medicine, Ltd. (CM): Y1

Co-PI Salary. Co-PI Hughes will commit 3.6 months p.a. (Y1-OY5). In Year 1, we request $15,120 salary for 3.6 months p.a. Co-PI Hughes will work with PI, Co-PIs and key personnel in Malaysia to coordinate all in-country lab and field activities including acquisition of local ethical approvals and permits; communicate with Government of Malaysia partners; ensure training and technology transfer occur smoothly, co-mentor graduate students from UM, coordinate with PREDICT activities, and contribute to data collection, analysis, reporting, and publication. We request a salary increase for Co-PI Hughes of 5% each year from Y2- OY5.

Other Personnel. The Malaysia team will include Microbiologist/Research Scientist, Mei Ho Lee, who will commit 3.6 months p.a. (Y1-OY5) to this project. In Year 1, we request $7,800 for 3.6 months p.a. Lee will assist with Luminex training, coordinating archived sample selection and screening using the Luminex-based platform at each partner lab. She will also contribute to study development, data analysis, reporting to partners and publication; Research Scientist, Jimmy Lee for 3.6 months p.a. (Y1-OY5) at $7,090 p.a. The Research Scientist will assist with sample repository curation, sample collection, field logistics and coordination, animal capture and sampling (with EHA Field Scientist). We request a salary increase of 5% p.a. for both the Senior Research Officer and the Research Assistant, respectively. We will hire an Administrative Assistant for 3.6 months p.a to help coordinate the logistics of the project, communicate with the PI, co-investigators, and GoM partners. We request S4,800 for 3.6 months p.a. (Y1-OY5) for the Administrative Assistant. We will also hire a Lab Technician for 6.0 months to work at DWNP, NPHL and UPM, as needed, to assist with training, sample curation, testing, and data entry into database. We request $6,000 p.a. in Y1 for Lab Technician. The entire Malaysia team will be located in KL, Malaysia.

Travel.
Domestic
Use of vehicle for in-country travel to field sites (Kuala Lipis, Gua Musang, Gombok Hospital, Ipoh, and others TBD) will cost approximately $5,000 p.a. for fuel, tolls, and vehicle maintenance.

Field and lab supplies. Table 1 shows the breakdown of samples that will be collected over the 3 + 2 optional years of this study. We request S12,120 in Y1 to cover costs for supplies for an Orang Asli and animal study in forested communities where 150 people will be sampled at a cost of S20/ per person; and 285 animals will be sampled at S32 per animal. Also in Y1, 2 training workshops that will include 4 technicians from each partner lab (PERHLITAN, NPHL, and UM). Training will be conducted for 10 days at each partner lab in Kuala Lumpur and will teach use of the Luminex-based serological assays, data interpretation and analysis, and reagent development. Costs will include local transportation costs, meals, lab reagents for training, and administrative costs. We have budgeted $5,000 p.a. to support transportation and accommodation costs for 2 field officers from DWNP, DVS, or MoH (max. 6 officers) to accompany CM team to conduct animal capture and sampling and human sampling at Orang Asli Field sites and for farm scoping visits at locations TBD in Peninsular Malaysia. Note: DWNP,

MoH or DVS officers' salaries are not included in this estimate, only costs while in the field, which may include per diems associated with additional travel, accommodation, and food costs.

Indirect costs. We are requesting S6,900 (10% of direct costs) for administrative and personnel costs.

Conservation Medicine (CM): Y2

Co-PI Salary. Co-PI Hughes will commit 3.6 months p.a. (Y1-OY5). In Year 2, we request $15,876.00 salary for 3.6 months p.a. Co-PI Hughes will work with PI, Co-PIs and key personnel in Malaysia to coordinate all in-country lab and field activities – including acquisition of local ethical approvals and permits; communicate with Government of Malaysia partners; ensure training and technology transfer occur smoothly, co-mentor graduate students from UM, coordinate with PREDICT activities, and contribute to data collection, analysis, reporting, and publication. We request a salary increase for Co-PI Hughes of 5% each year from Y2- OY5.

Other Personnel. In Year 2, we request $8,190.00 for 3.6 months p.a. for Mei Ho Lee, who will assist with Luminex training, coordinating archived sample selection and screening using the Luminex-based platform at each partner lab. She will also contribute to study development, data analysis, reporting to partners and publication; Research Scientist, Jimmy Lee for 3.6 months p.a. (Y1-OY5) at S7,302.00 p.a. The Research Scientist will assist with sample repository curation, sample collection, field logistics and coordination, animal capture and sampling (with EHA Field Scientist). We request a salary increase of 5% p.a. for both the Senior Research Officer and the Research Scientist, respectively. We will hire an Administrative Assistant for 3.6 months p.a to help coordinate the logistics of the project, communicate with the PI, co-investigators, and GoM partners. We request S4,800 for 3.6 months p.a. (Y1-OY5) for the Administrative Assistant. The Lab Technician will spend 6.0 months to work at DWNP, NPHL and VRI, as needed, to assist with training, sample curation, testing, and data entry into database. We request $6,000 p.a. in Y2 for Lab Technician. The entire Malaysia team will be located in KL, Malaysia.

Travel.
Domestic
Use of vehicle for in-country travel to field sites (Kuala Lipis, Gua Musang, Gombok Hospital, Ipoh, and others TBD) will cost approximately $5,000 p.a. for fuel, tolls, and vehicle maintenance.

Field and lab supplies. In Y2 the farm study begins. We have budgeted $36,500 in Y2 for consumables for both the second year of the Orang Asli hunting community study and the first year of the farm study. We estimate sampling approximately 900 animals (wildlife and domestic) calculated at S32/animal for supplies and logistics; Consumables will include traps, bags, disposables (e.g. needles, syringes, blood tubes, liquid nitrogen, etc…). We budgeted for sampling 165 people at $20/person. Costs include questionnaire materials, blood tubes, needles, syringes, liquid nitrogen, etc…) at 4 farm locations (TBD). We also request S3,000 for a 10-day training workshop for 4-6 technicians at the Universiti Putra Malaysia (UPM), in Kuala Lumpur. Training will include use of the Luminex based platform, data analysis, and reagent

development. We have budgeted $5,000 p.a. to support transportation and accommodation costs for 2 field officers from DWNP, DVS, or MoH (max. 6 officers) to accompany CM team to assist with animal capture and sampling and human interviews and sampling at farm locations in Peninsular Malaysia.

Indirect costs. We are requesting S9,725 (10% Direct costs) for administrative and personnel costs.

Conservation Medicine (CM): Y3

Co-PI Salary. Co-PI Hughes will commit 3.6 months p.a. In Year 3, we request $16,669.80 salary for 3.6 months p.a. Co-PI Hughes will work with PI, Co-PIs and key personnel in Malaysia to coordinate all in-country lab and field activities including acquisition of local ethical approvals and permits; communicate with Government of Malaysia partners; ensure training and technology transfer occur smoothly, co-mentor graduate students from UM, coordinate with PREDICT activities, and contribute to data collection, analysis, reporting, and publication. We request a salary increase for Co-PI Hughes of 5% each year from Y2- OY5.

Other Personnel. In Year 3, we request $8,599.50 for 3.6 months p.a. for Mei Ho Lee, who will assist with human and animal sample testing using the Luminex-based platform at each partner lab. She will also contribute to study development, data analysis, reporting to partners and publication; Research Scientist, Jimmy Lee will spend 3.6 months at S7,521.78 p.a. The Research Scientist will assist with sample repository curation, sample collection, field logistics and coordination, animal capture and sampling (with EHΛ Field Scientist), and data entry and analysis. We request a salary increase of 5% p.a. for both the Senior Research Officer and the Research Assistant, respectively. We request S4,800 for 6.0 months p.a. for the Administrative Assistant to help coordinate the logistics of the project, communicate with the PI, co-investigators, and GoM partners. We request $6,000 p.a. for the Lab Technician to work with DWNP, NPHL and VRI, as needed, to assist with training, sample curation, testing, and data entry into database. The entire Malaysia team will be located in Kuala Lumpur.

Travel.
Domestic
Use of vehicle for in-country travel to field sites (Kuala Lipis, Gua Musang, Gombok Hospital, Ipoh, and others TBD) will cost approximately $5,000 p.a. for fuel, tolls, and vehicle maintenance.

Field and lab supplies. We have budgeted S36,500 in Y3 for consumables for the third year of the Orang Asli hunting community study and the second year of the farm study. We estimate sampling approximately 900 animals (wildlife and domestic) calculated at S32/animal for supplies and logistics; Consumables will include traps, bags, disposables (e.g. needles, syringes, blood tubes, liquid nitrogen, etc…). We budgeted for sampling 165 people at $20/person. Costs include questionnaire materials, blood tubes, needles, syringes, liquid nitrogen, etc…) at 4 farm locations (TBD). We have budgeted $5,000 p.a. to support transportation and accommodation costs for 6 field officers from DWNP, and MoH to accompany CM team to assist with animal

capture and sampling and human interviews and sampling at Orang Asli villages in Peninsular Malaysia.

Indirect costs. We are requesting S9,595 (10% indirect costs) for administrative and personnel costs.

Conservation Medicine (CM): OY4

Co-PI Salary. Co-PI Hughes will commit 3.6 months p.a. (Y1-OY5). In Year 4, we request $17,503.29 salary for 3.6 months p.a. Co-PI Hughes will work with PI, Co-PIs and key personnel in Malaysia to coordinate all in-country lab and field activities including acquisition of local ethical approvals and permits; communicate with Government of Malaysia partners; ensure training and technology transfer occur smoothly, co-mentor graduate students from UM, coordinate with PREDICT activities, and contribute to data collection, analysis, reporting, and publication. We request a salary increase for Co-PI Hughes of 5% each year from Y2- OY5.

Other Personnel. In Option Year 4, we request S9,029.48 for 3.6 months p.a. for Mei Ho Lee who will assist with study development, permit acquisition, human and animal sample testing using the Luminex-based platform at each partner lab, data analysis, reporting to partners and publication. Jimmy Lee will spend 3.6 months at S7,747.43 p.a. and will assist with sample repository curation, sample collection, field logistics and coordination, animal capture and sampling (with EHA Field Scientist), and data entry and analysis. We request a salary increase of 5% p.a. for both the Senior Research Officer and the Research Assistant, respectively. We request S4,800 for 6.0 months for an Administrative Assistant to help coordinate the logistics of the project, communicate with the PI, co-investigators, and GoM partners. We request $6,000 in OY4 for the Lab Technician for 6.0 months to work with DWNP, NPHL and VRI, as needed, to assist with training, sample curation, testing, and data entry into database. The entire Malaysia team will be located in Kuala Lumpur, Malaysia.

Travel.

Domestic

Use of vehicle for in-country travel to field sites (Kuala Lipis, Gua Musang, Gombok Hospital, Ipoh, and others TBD) will cost approximately $5,000 p.a. for fuel, tolls, and vehicle maintenance.

Field and lab supplies. We have budgeted S36,500 in OY4 for consumables for both the final year of the Orang Asli hunting community study and the third year of the farm study. We estimate sampling approximately 900 animals (wildlife and domestic) calculated at S32/animal for supplies and logistics; Consumables will include traps, bags, disposables (e.g. needles, syringes, blood tubes, liquid nitrogen, etc…). We budgeted for sampling 165 people at $20/person. Costs include questionnaire materials, blood tubes, needles, syringes, liquid nitrogen, etc…) at 4 farm locations (TBD). (as in Y2). We have budgeted S3,500 p.a. to support transportation and accommodation costs for 4 field officers from DWNP, VRI, and MoH to accompany CM team to assist with animal capture and sampling and human interviews and sampling at farm locations in Peninsular Malaysia.

Indirect costs. We are requesting $9,622 (10% Direct costs). for administrative and personnel costs.

Conservation Medicine (CM): OY5

Co-PI Salary. Co-PI Hughes will commit 3.6 months p.a. (Y1-OY5). In Year 5, we request $18,378.45 salary for 3.6 months p.a. Co-PI Hughes will work with PI, Co-PIs and key personnel in Malaysia to coordinate all in-country lab and field activities – including acquisition of local ethical approvals and permits; communicate with Government of Malaysia partners; ensure training and technology transfer occur smoothly, co-mentor graduate students from UM, coordinate with PREDICT activities, and contribute to data collection, analysis, reporting, and publication. We request a salary increase for Co-PI Hughes of 5% each year from Y2- OY5. He will attend the DTRA Annual Technical Review

Other Personnel. In Option Year 5 (OY5), we request $9,480.95 for 3.6 months p.a. for Mei Ho Lee to assist with study development, permit acquisition, human and animal sample testing using the Luminex-based platform at each partner lab, data analysis, reporting to partners and publication. We request $7,979.86 for Research Assistant, Jimmy Lee for 3.6 months p.a. to assist with sample repository curation, sample collection, field logistics and coordination, animal capture and sampling (with EHA Field Scientist), and data entry and analysis. We request a salary increase of 5% p.a. for both the Senior Research Officer and the Research Assistant, respectively. We request $4,800 for the Administrative Assistant for 6 months p.a to help coordinate the logistics of the project, communicate with the PI, co-investigators, and GoM partners. We request $6,000 p.a. for the Lab Technician to work with DWNP, NPHL and VRI, as needed, to assist with training, sample curation, testing, and data entry into database. The entire Malaysia team will be located in Kuala Lumpur, Malaysia.

Travel.
Domestic
Use of vehicle for in-country travel to field sites (Kuala Lipis, Gua Musang, Gombok Hospital, Ipoh, and others TBD) will cost approximately $5,000 p.a. for fuel, tolls, and vehicle maintenance.

Field and lab supplies. We have budgeted We have budgeted $24,380 in OY5 for consumables for the final year of the farm study. We estimate sampling approximately 760 animals (wildlife and domestic) calculated at $32/animal for supplies and logistics; Consumables will include traps, bags, disposables (e.g. needles, syringes, blood tubes, liquid nitrogen, etc…). We budgeted for sampling 15 people at $20/person. Costs include questionnaire materials, blood tubes, needles, syringes, liquid nitrogen, etc…) at 4 farm locations (TBD). We have budgeted $3,500 p.a. to support transportation and accommodation costs for 4 field officers from DWNP, VRI, and MoH to accompany CM team to assist with animal capture and sampling and human interviews and sampling at farm locations in Peninsular Malaysia.

Indirect costs. We are requesting $8,747 (10% direct costs) for administrative and personnel costs.

Table 1. Sample totals.

Task	Samples Y1-Y2	Samples Y3-OY5	Total Samples Y1-OY5	Samples collected by:	Tested by
3	950 macaque		950 macaque	PREDICT (Archived)	DWNP
3	175 bat		175 bat	PREDICT (Archived)	DWNP
3	300 Orang Asli		300 Orang Asli	PREDICT (Archived)	NPHL
3	200 Orang Asli		200 Orang Asli	UM / NMRC-A (Archived)	UM
4	300 Orang Asli	300 Orang Asli	600 Orang Asli	CM, MoH	NPHL
4	450 bats, 30 NHP	450 bats, 30 NHP	900 bat, 60 NHP	CM, DWNP	DWNP
4	90 dogs	90 dogs	180 dogs	CM	UPM
4	up to 1000 OA	up to 1500 OA	up to 2500 Orang Asli	NMRC-A/UM active project	UM
5	800 bats, 120 NHP	800 bats, 120 NHP	1600 bats, 240 NHP	CM, DWNP	DWNP
5	600 livestock	600 livestock	1200 livestock	UPM, DVS, CM	UPM
5	60 farm workers	60 farm workers	120 farm workers	MoH, CM	NPHL

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein
CBEP-Thrust Area 6, CC WMD

Naval Medical Research Center – Asia (NMRC-A): Y1
Co-PI Salary: Co-PI Pike will commit 2 month percent effort (Y1-OY5). However, the conduct of the study is considered part of his official duties as a government employee. Therefore, we are not requesting any salary for Dr. Pike. Dr. Pike will serve as the lead DoD liaison, providing local collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed.

Travel: Co-Pike will conduct one 5-day trip twice per year (Y1-OY5) from NMRC-A in Singapore to KL for project oversight and management. We estimate each trip to cost $1,580, ($265 RT airfare + $1,315 ($263*5 days). Total travel for Year 1 will be $3,160.

Contracts: NMRC-A will subcontract with the University of Malaya (UM) for all field and laboratory work conducted within the scope of this proposal. Estimated contract costs are $45K/year (Y1-OY5). See accompanying UM budget below.

Tropical Infectious Diseases Research and Education Centre (TIDREC): Y1
PI Salary. PI AbuBakar will commit 1 month p.a. (Y1-OY5). We will request 0.4 month's salary ($4000) and will match the rest of the salary with institutional funding. PI AbuBakar will meet with Project Leader and other PIs involved in this project collaboration. He will work with Co-PI Chang and Key Personnel to meet with the relevant ministries and agencies in Malaysia to initiate the project. Co-PI Chang will commit 2 months p.a. (Y1-OY5) to the project. We will request 0.8 month's salary ($4000) and will match the rest of the salary with institutional funding. She will work with PI AbuBakar to coordinate with the partners involved in this project collaboration. She will work with Key Personnel to ensure that all relevant permits such as IRB/IBBC are submitted and approved. She will work closely with Key Personnel on various parts of the project. She will also work closely with Key Personnel Khor in authoring peer-reviewed publication describing the findings from the project.

Other Personnel. Key Personnel (KP) Khor will commit 6 months p.a. (Y1-OY5) and we will request 2.4 month's salary ($6000). KP Khor will meet with the partners, specifically from the relevant local ministries and agencies to finalize field protocols. He will develop the protocols for the sampling and transportation of samples, laboratory tests procedures and sample/data storage. He will oversee the laboratory testing. He will also be involved in authoring peer-reviewed publication describing the findings from the project. We will support a PhD candidate in molecular virology and epidemiology. He/she will spend at least 2 weeks in the U.S. to be trained in the laboratory testing for henipaviruses and filoviruses. He/she will be responsible for the laboratory testing for henipaviruses and filoviruses. We will hire a project administrator committed to 0.8 month p.a. (Y1-OY5) ($1400). He/she will assist with communication with the local partners and relevant authorities, and other administrative work relevant to the project. A technician will be hired for 4 months p.a. (Y1-OY5) ($6000). He/she will assist in conducting the laboratory testing.

Travel.
International: PhD candidate will visit the U.S. once for meetings/training in the Washington DC area for $4,992, ($2000 airfare + $2,950 ($295*10 days) + $42 misc. travel costs.

Malaysia Domestic: KP Khor and PhD candidate will visit the collection sites (21 sites) twice a year in Y1 ($0.16/km*150km*42 = $1008).

Other Direct Costs

Materials and Supplies. We are estimating at least $4000 p.a. to purchase materials for sampling, such as nitrile gloves, needles, vacutainer, alcohol swabs, plasters, etc. We will need maintenance and calibration for luminex related equipment. On-site assistants will assist in recruitment of individuals for the project, administration of questionnaire, collection of samples and arrangement of delivering the serum samples to TIDREC for laboratory testing. The on-site assistants will be paid $5 per sample collected, and we estimate a total of 1000 samples to be collected a year (Y1-OY5) ($5000). We are budgeting $2500 p.a. for services to transport the collected samples from the collection sites to TIDREC. We are budgeting $500 p.a. for computer software licenses such as Avira, Bitdefender or AVG.

Indirect Costs. We are requesting indirect cost of 10% on all direct costs as applied by our institution.

Tuition. We are budgeting $4000 p.a. per student to partially cover the tuition for the PhD program at University of Malaya and living expenses for Y1.

Indirect Costs: The indirect rate at NMRC-A is $10.66/hour of percent effort. For Co-PI Pike, the indirect cost rate is $1840.34 ($10.66 (seat rate)*0.083(percent effort)*2080 (hours/year)=$1840.34)

Naval Medical Research Center – Asia (NMRC-A): Y2

Co-PI Salary: Co-PI Pike will commit 2 month percent effort (Y1-OY5). However, the conduct of the study is considered part of his official duties as a government employee. Therefore, we are not requesting any salary for Dr. Pike. Dr. Pike will serve as the lead DoD liaison, providing local collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed.

Travel: Co-Pike will conduct one 5-day trip twice per year (Y1-OY5) from NMRC-A in Singapore to KL for project oversight and management. We estimate each trip to cost $1,580, ($265 RT airfare + $1,315 ($263*5 days). Total travel for Year 2 will be $3,160.

Contracts: NMRC-A will subcontract with the University of Malaya (UM) for all field and laboratory work conducted within the scope of this proposal. Estimated contract costs are $45K/year (Y1-OY5). See accompanying UM budget below.

Tropical Infectious Diseases Research and Education Centre (TIDREC): Y2

PI Salary. PI AbuBakar will commit 1 month p.a. (Y1-OY5). We will request 0.4 month's salary ($4000) and will match the rest of the salary with institutional funding. PI AbuBakar will meet with Project Leader and other PIs involved in this project collaboration. He will work with Co-PI Chang and Key Personnel to meet with the relevant ministries and agencies in Malaysia to initiate the project. Co-PI Chang will commit 2 months p.a. (Y1-OY5) to the project. We will request 0.8 month's salary ($4000) and will match the rest of the salary with institutional funding. She will work with PI AbuBakar to coordinate with the partners involved in this project collaboration. She will work with Key Personnel to ensure that all relevant permits such as IRB/IBBC are submitted and approved. She will work closely with Key Personnel on various parts of the project. She will also work closely with Key Personnel Khor in authoring peer-reviewed publication describing the findings from the project.

Other Personnel. Key Personnel (KP) Khor will commit 6 months p.a. (Y1-OY5) and we will request 2.4 month's salary ($6000). KP Khor will meet with the partners, specifically from the relevant local ministries and agencies to finalize field protocols. He will develop the protocols for the sampling and transportation of samples, laboratory tests procedures and sample/data storage. He will oversee the laboratory testing. He will also be involved in authoring peer-reviewed publication describing the findings from the project. We will support a PhD candidate in molecular virology and epidemiology. He/she will spend at least 2 weeks in the U.S. to be trained in the laboratory testing for henipaviruses and filoviruses. He/she will be responsible for the laboratory testing for henipaviruses and filoviruses. We will hire a project administrator committed to 0.8 month p.a. (Y1-OY5) ($1400). He/she will assist with communication with the local partners and relevant authorities, and other administrative work relevant to the project. A technician will be hired for 4 months p.a. (Y1-OY5) ($6000). He/she will assist in conducting the laboratory testing.

Travel.
KP Khor and PhD candidate will visit the collection sites (21 sites) twice a year in Y2 ($0.16/km*150km*42 = $1008).

Other Direct Costs
Materials and Supplies. We are estimating at least $5000 p.a. to purchase materials for sampling, such as nitrile gloves, needles, vacutainer, alcohol swabs, plasters, etc. We will need maintenance and calibration for luminex related equipment p.a. ($8000). On-site assistants will assist in recruitment of individuals for the project, administration of questionnaire, collection of samples and arrangement of delivering the serum samples to TIDREC for laboratory testing. The on-site assistants will be paid $5 per sample collected, and we estimate a total of 1000 samples to be collected a year (Y1-OY5) ($5000). We are budgeting $2500 p.a. for services to transport the collected samples from the collection sites to TIDREC. We are budgeting $500 p.a. for computer software licenses such as Avira, Bitdefender or AVG.

Indirect Costs. We are requesting indirect cost of 10% on all direct costs as applied by our institution.

Tuition. We are budgeting $4000 p.a. per student to partially cover the tuition for the PhD program at University of Malaya and living expenses for Y2.

Indirect Costs: The indirect rate at NMRC-A is $10.66/hour of percent effort. For Co-PI Pike, the indirect cost rate is $1840.34 ($10.66 (seat rate)*0.083(percent effort)*2080 (hours/year)–$1840.34)

Naval Medical Research Center – Asia (NMRC-A): Y3

Co-PI Salary: Co-PI Pike will commit 2 month percent effort (Y1-OY5). However, the conduct of the study is considered part of his official duties as a government employee. Therefore, we are not requesting any salary for Dr. Pike. Dr. Pike will serve as the lead DoD liaison, providing local collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed.

Travel: Co-Pike will conduct one 5-day trip twice per year (Y1-OY5) from NMRC-A in Singapore to KL for project oversight and management. We estimate each trip to cost $1,580, ($265 RT airfare + $1,315 ($263*5 days). Total travel for Year 3 will be $3,160.

Contracts: NMRC-A will subcontract with the University of Malaya (UM) for all field and laboratory work conducted within the scope of this proposal. Estimated contract costs are $45K/year (Y1-OY5). See accompanying UM budget below.

Tropical Infectious Diseases Research and Education Centre (TIDREC): Y3

PI Salary. PI AbuBakar will commit 1 month p.a. (Y1-OY5). We will request 0.4 month's salary ($4000) and will match the rest of the salary with institutional funding. PI AbuBakar will meet with Project Leader and other PIs involved in this project collaboration. He will work with Co-PI Chang and Key Personnel to meet with the relevant ministries and agencies in Malaysia to initiate the project. Co-PI Chang will commit 2 months p.a. (Y1-OY5) to the project. We will request 0.8 month's salary ($4000) and will match the rest of the salary with institutional funding. She will work with PI AbuBakar to coordinate with the partners involved in this project collaboration. She will work with Key Personnel to ensure that all relevant permits such as IRB/IBBC are submitted and approved. She will work closely with Key Personnel on various parts of the project. She will also work closely with Key Personnel Khor in authoring peer-reviewed publication describing the findings from the project.

Other Personnel. Key Personnel (KP) Khor will commit 6 months p.a. (Y1-OY5) and we will request 2.4 month's salary ($6000). KP Khor will meet with the partners, specifically from the relevant local ministries and agencies to finalize field protocols. He will develop the protocols for the sampling and transportation of samples, laboratory tests procedures and sample/data storage. He will oversee the laboratory testing. He will also be involved in authoring peer-reviewed publication describing the findings from the project. We will support a PhD candidate in molecular virology and epidemiology. He/she will spend at least 2 weeks in the U.S. to be trained in the laboratory testing for henipaviruses and filoviruses. He/she will be responsible for the laboratory testing for henipaviruses and filoviruses. We will hire a project administrator committed to 0.8 month p.a. (Y1-OY5) ($1400). He/she will assist with communication with the local partners and relevant authorities, and other administrative work relevant to the project. A technician will be hired for 4 months p.a. (Y1-OY5) ($6000). He/she will assist in conducting the laboratory testing.

Travel.

KP Khor and PhD candidate will visit the collection sites (21 sites) twice a year in Y3 ($0.16/km*150km*42 = $1008).

Other Direct Costs

Materials and Supplies. We are estimating at least $5000 p.a. to purchase materials for sampling, such as nitrile gloves, needles, vacutainer, alcohol swabs, plasters, etc. We will need maintenance and calibration for luminex related equipment p.a. ($8000). On-site assistants will assist in recruitment of individuals for the project, administration of questionnaire, collection of samples and arrangement of delivering the serum samples to TIDREC for laboratory testing. The on-site assistants will be paid $5 per sample collected, and we estimate a total of 1000 samples to be collected a year (Y1-OY5) ($5000). We are budgeting $2500 p.a. for services to transport the collected samples from the collection sites to TIDREC. We are budgeting $500 p.a. for computer software licenses such as Avira, Bitdefender or AVG.

Indirect Costs. We are requesting indirect cost of 10% on all direct costs as applied by our institution.

Tuition. We are budgeting $4000 p.a. per student to partially cover the tuition for the PhD program at University of Malaya and living expenses for Y3.

Indirect Costs: The indirect rate at NMRC-A is $10.66/hour of percent effort. For Co-PI Pike, the indirect cost rate is $1840.34 ($10.66 (seat rate)*0.083(percent effort)*2080 (hours/year)=$1840.34)

Naval Medical Research Center – Asia (NMRC-A): OY4

Co-PI Salary: Co-PI Pike will commit 2 month percent effort (Y1-OY5). However, the conduct of the study is considered part of his official duties as a government employee. Therefore, we are not requesting any salary for Dr. Pike. Dr. Pike will serve as the lead DoD liaison, providing local collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed.

Travel: Co-Pike will conduct one 5-day trip twice per year (Y1-OY5) from NMRC-A in Singapore to KL for project oversight and management. We estimate each trip to cost $1,580, ($265 RT airfare + $1,315 ($263*5 days). Total travel for OY4 will be $3,160.

Contracts: NMRC-A will subcontract with the University of Malaya (UM) for all field and laboratory work conducted within the scope of this proposal. Estimated contract costs are $45K/year (Y1-OY5). See accompanying UM budget below.

Tropical Infectious Diseases Research and Education Centre (TIDREC): OY4

PI Salary. PI AbuBakar will commit 1 month p.a. (Y1-OY5). We will request 0.4 month's salary ($4000) and will match the rest of the salary with institutional funding. PI AbuBakar will meet with Project Leader and other PIs involved in this project collaboration. He will work with Co-PI Chang and Key Personnel to meet with the relevant ministries and agencies in Malaysia to initiate the project. Co-PI Chang will commit 2 months p.a. (Y1-OY5) to the project. We will request 0.8 month's salary ($4000) and will match the rest of the salary with institutional funding. She will work with PI AbuBakar to coordinate with the partners involved in this project collaboration. She will work with Key Personnel to ensure that all relevant permits such as IRB/IBBC are submitted and approved. She will work closely with Key Personnel on various parts of the project. She will also work closely with Key Personnel Khor in authoring peer-reviewed publication describing the findings from the project.

Other Personnel. Key Personnel (KP) Khor will commit 6 months p.a. (Y1-OY5) and we will request 2.4 month's salary ($6000). KP Khor will meet with the partners, specifically from the relevant local ministries and agencies to finalize field protocols. He will develop the protocols for the sampling and transportation of samples, laboratory tests procedures and sample/data storage. He will oversee the laboratory testing. He will also be involved in authoring peer-reviewed publication describing the findings from the project. We will support a PhD candidate in molecular virology and epidemiology. He/she will spend at least 2 weeks in the U.S. to be trained in the laboratory testing for henipaviruses and filoviruses. He/she will be responsible for the laboratory testing for henipaviruses and filoviruses. We will hire a project administrator committed to 0.8 month p.a. (Y1-OY5) ($1400). He/she will assist with communication with the local partners and relevant authorities, and other administrative work relevant to the project. A technician will be hired for 4 months p.a. (Y1-OY5) ($6000). He/she will assist in conducting the laboratory testing.

Travel.
KP Khor and PhD candidate will visit the collection sites (21 sites) twice a year in OY4 ($0.16/km*150km*42 = $1008).

Other Direct Costs

Materials and Supplies. We are estimating at least $5000 p.a. to purchase materials for sampling, such as nitrile gloves, needles, vacutainer, alcohol swabs, plasters, etc. We will need maintenance and calibration for luminex related equipment p.a. ($8000). On-site assistants will assist in recruitment of individuals for the project, administration of questionnaire, collection of samples and arrangement of delivering the serum samples to TIDREC for laboratory testing. The on-site assistants will be paid $5 per sample collected, and we estimate a total of 1000 samples to be collected a year (Y1-OY5) ($5000). We are budgeting $2500 p.a. for services to transport the collected samples from the collection sites to TIDREC. We are budgeting $500 p.a. for computer software licenses such as Avira, Bitdefender or AVG.

Indirect Costs. We are requesting indirect cost of 10% on all direct costs as applied by our institution.

Tuition. We are budgeting $4000 p.a. per student to partially cover the tuition for the PhD program at University of Malaya and living expenses for OY4.

Indirect Costs: The indirect rate at NMRC-A is $10.66/hour of percent effort. For Co-PI Pike, the indirect cost rate is $1840.34 ($10.66 (seat rate)*0.083(percent effort)*2080 (hours/year)=$1840.34)

Naval Medical Research Center – Asia (NMRC-A): OY5

Co-PI Salary: Co-PI Pike will commit 2 month percent effort (Y1-OY5). However, the conduct of the study is considered part of his official duties as a government employee. Therefore, we are not requesting any salary for Dr. Pike. Dr. Pike will serve as the lead DoD liaison, providing local collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed.

Travel: Co-Pike will conduct one 5-day trip twice per year (Y1-OY5) from NMRC-A in Singapore to KL for project oversight and management. We estimate each trip to cost $1,580, ($265 RT airfare + $1,315 ($263*5 days). Total travel for OY5 will be $3,160.

Contracts: NMRC-A will subcontract with the University of Malaya (UM) for all field and laboratory work conducted within the scope of this proposal. Estimated contract costs are $45K/year (Y1-OY5). See accompanying UM budget below.

Tropical Infectious Diseases Research and Education Centre (TIDREC): OY5

PI Salary. PI AbuBakar will commit 1 month p.a. (Y1-OY5). We will request 0.4 month's salary ($4000) and will match the rest of the salary with institutional funding. PI AbuBakar will meet with Project Leader and other PIs involved in this project collaboration. He will work with Co-PI Chang and Key Personnel to meet with the relevant ministries and agencies in Malaysia to initiate the project. Co-PI Chang will commit 2 months p.a. (Y1-OY5) to the project. We will request 0.8 month's salary ($4000) and will match the rest of the salary with institutional funding. She will work with PI AbuBakar to coordinate with the partners involved in this project collaboration. She will work with Key Personnel to ensure that all relevant permits such as IRB/IBBC are submitted and approved. She will work closely with Key Personnel on various parts of the project. She will also work closely with Key Personnel Khor in authoring peer-reviewed publication describing the findings from the project.

Other Personnel. Key Personnel (KP) Khor will commit 6 months p.a. (Y1-OY5) and we will request 2.4 month's salary ($6000). KP Khor will meet with the partners, specifically from the relevant local ministries and agencies to finalize field protocols. He will develop the protocols for the sampling and transportation of samples, laboratory tests procedures and sample/data storage. He will oversee the laboratory testing. He will also be involved in authoring peer-reviewed publication describing the findings from the project. We will support a PhD candidate in molecular virology and epidemiology. He/she will spend at least 2 weeks in the U.S. to be trained in the laboratory testing for henipaviruses and filoviruses. He/she will be responsible for the laboratory testing for henipaviruses and filoviruses. We will hire a project administrator committed to 0.8 month p.a. (Y1-OY5) ($1400). He/she will assist with communication with the local partners and relevant authorities, and other administrative work relevant to the project. A technician will be hired for 4 months p.a. (Y1-OY5) ($6000). He/she will assist in conducting the laboratory testing.

Travel.
KP Khor and PhD candidate will visit the collection sites (21 sites) twice a year in OY5 ($0.16/km*150km*42 – $1008).

Other Direct Costs
Materials and Supplies. We are estimating at least $5000 p.a. to purchase materials for sampling, such as nitrile gloves, needles, vacutainer, alcohol swabs, plasters, etc. We will need maintenance and calibration for luminex related equipment p.a. ($8000). On-site assistants will assist in recruitment of individuals for the project, administration of questionnaire, collection of samples and arrangement of delivering the serum samples to TIDREC for laboratory testing. The on-site assistants will be paid $5 per sample collected, and we estimate a total of 1000 samples to be collected a year (Y1-OY5) ($5000). We are budgeting $2500 p.a. for services to transport the collected samples from the collection sites to TIDREC. We are budgeting $500 p.a. for computer software licenses such as Avira, Bitdefender or AVG.

Indirect Costs. We are requesting indirect cost of 10% on all direct costs as applied by our institution.

Tuition. We are budgeting $4000 p.a. per student to partially cover the tuition for the PhD program at University of Malaya and living expenses for OY5.

Indirect Costs: The indirect rate at NMRC-A is $10.66/hour of percent effort. For Co-PI Pike, the indirect cost rate is $1840.34 ($10.66 (seat rate)*0.083(percent effort)*2080 (hours/year)–$1840.34)

The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences (USU): Y1

PI Salary. Co-PI Christopher C Broder will commit 1.0 months p.a. (Y1-OY5), though no salary is requested for Broder, as he is funded by other funding organizations. Co-PI Broder will coordinate and oversee the efforts of a research assistant, postdoctoral fellow and a graduate student. The work on this project will be performed by Broder and the personnel listed below.

Other Personnel. The postdoctoral fellow, Eric Laing, will commit 12 months p.a. (Y1-OY5) to this project. In Year 1, we request $48,000. Laing will be the USU key personnel training and conducting the on-site Luminex training modules in the Malaysian laboratories along with consultant, Gary Crameri. Laing will also help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training on the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. Laing's salary will increase each year by 3.0%. The research technician, Lianying Yan, will commit 6 months p.a. (Y1-OY5) to this project. In Year 1, we request $25,243. Yan will help oversee the training of Malaysian graduate students and staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. The graduate student, Sofia DeSilva, will commit 6 months p.a. (Y1-OY4) to this project. In Year 1, we request $17,800. DeSilva will help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA, and also VSV-based reporter virus neutralization assays.

Fringe Benefits. The fringe rate used is 32.32% for Henry M. Jackson Foundation (HJF).

Equipment. N/A

Travel:
Domestic. N/A

International. We request $10,000 for international travel for Co-PI Broder and postdoctorate student Laing for Y1-OY5. Broder and Laing will travel once per year to Malaysia for training purposes. Individually, yearly trip will total $5,000 ($2,000 airfare + $2,630 ($263*10 days) + 370 misc. travel costs.

Other Direct Costs.
Materials and Supplies. In Year 1, we request $22,000 for luminex reagent production and consumables, molecular biology reagents for $2,000 and cell culture materials and supplies for $3,000.

Indirect Costs. The USU On-site overhead rate of 34.74%, less subawards; additional 14.30%, Company-wide G&A rate is applied on the total direct cost less subaward plus the USU on-site overhead rate. For proposals including subawards, additional 1.0% is applied on total subaward cost. The above indirect cost and fringe benefit rates for FY 2016 were proposed to the USAMRAA on September 11, 2015.

The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences (USU): Y2

PI Salary. Co-PI Christopher C Broder will commit 1.0 months p.a. (Y1-OY5), though no salary is requested for Broder, as he is funded by other funding organizations. Co-PI Broder will coordinate and

oversee the efforts of a research assistant, postdoctoral fellow and a graduate student. The work on this project will be performed by Broder and the personnel listed below.

Other Personnel. The postdoctoral fellow, Eric Laing, will commit 12 months p.a. (Y1-OY5) to this project. In Year 2, we request $49,440. Laing will be the USU key personnel training and conducting the on-site Luminex training modules in the Malaysian laboratories along with consultant, Gary Crameri. Laing will also help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training on the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. Laing's salary will increase each year by 3.0%. The research technician, Lianying Yan, will commit 6 months p.a. (Y1-OY5) to this project. In Year 2, we request $26,000.29. Yan will help oversee the training of Malaysian graduate students and staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. The graduate student, Sofia DeSilva, will commit 6 months p.a. (Y1-OY4) to this project. In Year 2, we request $17,801. DeSilva will help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA, and also VSV-based reporter virus neutralization assays.

Fringe Benefits. The fringe rate used is 32.32% for Henry M. Jackson Foundation (HJF).

Equipment. N/A

Travel:
Domestic. N/A

International. We request $10,000 for international travel for Co-PI Broder and postdoctoral student Laing for Y1-OY5. Broder and Laing will travel once per year to Malaysia for training purposes. Individually, yearly trip will total $5,000 ($2,000 airfare + $2,630 ($263*10 days) + 370 misc. travel costs. In Year 2, two Malaysian lab staff members will travel to the USU lab for training for a total of $10,000. We request $5,000 per person, ($2,000 + $2,916 ($243*12 days) + $84 misc. travel costs.

Other Direct Costs.
Materials and Supplies. In Year 2, we have budgeted $22,000 for Luminex reagent development and consumables, a new generic protein (from newly discovered viruses) development and production is budgeted for $16,250 (partially outlines below). We will purchase molecular biology reagents for $2,000 and cell culture materials and supplies for $3,000.

Table 1: Time and material expense for producing-5mg soluble viral glycoprotein of a henipavirus or filovirus (a new unknown virus)

Items	Time	Description	Unit price$	Quant. required	Total in $
Gene synthesis		Companies(GenScript)	750/gene	1	750
Gene amplification	2 wks	E. coli competent cell	380/kit	0.1	38
		Plasmid Prep kit	399/box	0.1	40
		LB plate and medium	50/exp	1	50
Construction of expression vector	5 wks	Restriction enzyme	250/kit	0.1	25
		Oligo (primers)	0.5/bp	100	50
		BigDye	1180	0.1	118
		Sequencing	10/each	10	100

		QCM kit	750	0.1	75
Transfection	1 wks	Transfection reagent Fugene (Roche)	500/kit	0.1	50
		Cell line			
		Culture Medium	20/bottle	10	200
Selection of stable cell line	8 wks	Drug-Hygromycin	100	2	200
		Lab disposal material (tips, pipette, 96,24-well plates etc.)			300
Protein expression	2 wks	Buffers, DMEM Serum-free Medium	10 95	5 2	50 190
		Shaker Flaks and Filter unit	15 20	20 20	300 400
Protein purification	2 wks	Twin strep tag resin	554/per 20ml	1	554
		(for this step and all steps above) SDS PAGE Native gel	15/gel 15/gel	50 50	750 750
		Anti-TST antibody substrate ECL	380/each	0.1	4
		fXa cleavage kit	280/each	0.33	90
Luminex beads and testing	1 wk	#33 (example)	665/each	1	665
Labor	21wks (50%)	Salary	1000/wk	2	10,500
Total					16,250

Indirect Costs. The USU On-site overhead rate of 34.74%, less subawards; additional 14.30%, Company-wide G&A rate is applied on the total direct cost less subaward plus the USU on-site overhead rate. For proposals including subawards, additional 1.0% is applied on total subaward cost. The above indirect cost and fringe benefit rates for FY 2016 were proposed to the USAMRAA on September 11, 2015.

The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences (USU): Y3

PI Salary. Co-PI Christopher C Broder will commit 1.0 months p.a. (Y1-OY5), though no salary is requested for Broder, as he is funded by other funding organizations. Co-PI Broder will coordinate and oversee the efforts of a research assistant, postdoctoral fellow and a graduate student. The work on this project will be performed by Broder and the personnel listed below.

Other Personnel. The postdoctoral fellow, Eric Laing, will commit 12 months p.a. (Y1-OY5) to this project. In Year 3, we request $50,923.20. In Y3-OY5, Laing will be the USU key personnel assisting in-country partner labs with testing and data analysis, troubleshooting, study design, meeting with UM graduate students, and attending the annual meeting in KL. Laing will also help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training on the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. Laing's salary will increase each year by 3.0%. The research technician, Lianying Yan, will commit 6 months p.a. (Y1-OY5) to this project. In Year 3, we request $26,780.30. Yan will help oversee the training of Malaysian graduate students and staff who will visit the USU lab for training in the concepts

and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. The graduate student, Sofia DeSilva, will commit 6 months p.a. (Y1-OY4) to this project. In Year 3, we request $17,802. DeSilva will help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA, and also VSV-based reporter virus neutralization assays.

Fringe Benefits. The fringe rate used is 32.32% for Henry M. Jackson Foundation (HJF).

Equipment. N/A

Travel:
Domestic. N/A

International. We request $11,500 for international travel for Co-PI Broder and postdoctoral student Laing for Y1-OY5. Broder and Laing will travel once per year to Malaysia for training purposes. Individually, yearly trip will total $5,750 ($2,000 airfare + $3,419 ($263*10 days) + 331 misc. travel costs. In Year 3, one Malaysian lab staff member will travel to the USU lab for training for a total of $5,000, ($2,000 + $2,916 ($243*12 days) + $84 misc. travel costs.

Other Direct Costs.
Materials and Supplies. In Year 3, we request $22,000 for Luminex reagent production and consumables, molecular biology reagents for $2,000 and cell culture materials and supplies for $3,000.

Indirect Costs. The USU On-site overhead rate of 34.74%, less subawards; additional 14.30%, Company-wide G&A rate is applied on the total direct cost less subaward plus the USU on-site overhead rate. For proposals including subawards, additional 1.0% is applied on total subaward cost. The above indirect cost and fringe benefit rates for FY 2016 were proposed to the USAMRAA on September 11, 2015.

The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences (USU): OY4

PI Salary. Co-PI Christopher C Broder will commit 1.0 months p.a. (Y1-OY5), though no salary is requested for Broder, as he is funded by other funding organizations. Co-PI Broder will coordinate and oversee the efforts of a research assistant, postdoctoral fellow and a graduate student. The work on this project will be performed by Broder and the personnel listed below.

Other Personnel. The postdoctoral fellow, Eric Laing, will commit 12 months p.a. (Y1-OY5) to this project. In OY4, we request $52,450.90. In Y3-OY5, Laing will be the USU key personnel assisting in-country partner labs with testing and data analysis, troubleshooting, study design, meeting with UM graduate students, and attending the annual meeting in KL. Laing will also help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training on the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. Laing's salary will increase each year by 3.0%. The research technician, Lianying Yan, will commit 6 months p.a. (Y1-OY5) to this project. In OY4, we request $27,583.71. Yan will help oversee the training of Malaysian graduate students and staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. The graduate student, Sofia DeSilva, will commit 6 months p.a. (Y1-OY4) to this project. In OY4, we request $17,803. DeSilva will help oversee the training of Malaysian graduate students or staff

who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA, and also VSV-based reporter virus neutralization assays.

Fringe Benefits. The fringe rate used is 32.32% for Henry M. Jackson Foundation (HJF).

Equipment. N/A

Travel:
Domestic. N/A

International. We request $10,000 for international travel for Co-PI Broder and postdoctoral student Laing for Y1-OY5. Broder and Laing will travel once per year to Malaysia for training purposes. Individually, yearly trip will total $5,000 ($2,000 airfare + $2,630 ($263*10 days) + 370 misc. travel costs.

Other Direct Costs.
Materials and Supplies. We have budgeted $15,000 for Luminex reagent development and consumables, a new generic protein (from newly discovered viruses) development and production is budgeted for $16,250. We will purchase molecular biology reagents for $2,000 and cell culture materials and supplies for $3,000.

Indirect Costs. The USU On-site overhead rate of 34.74%, less subawards; additional 14.30%, Company-wide G&A rate is applied on the total direct cost less subaward plus the USU on-site overhead rate. For proposals including subawards, additional 1.0% is applied on total subaward cost. The above indirect cost and fringe benefit rates for FY 2016 were proposed to the USAMRAA on September 11, 2015.

The Henry M. Jackson Foundation at Uniformed Services University of the Health Sciences (USU): OY5

PI Salary. Co-PI Christopher C Broder will commit 1.0 months p.a. (Y1-OY5), though no salary is requested for Broder, as he is funded by other funding organizations. Co-PI Broder will coordinate and oversee the efforts of a research assistant, postdoctoral fellow and a graduate student. The work on this project will be performed by Broder and the personnel listed below.

Other Personnel. The postdoctoral fellow, Eric Laing, will commit 12 months p.a. (Y1-OY5) to this project. In OY5, we request $54,024.42. In Y3-OY5, Laing will be the USU key personnel assisting in-country partner labs with testing and data analysis, troubleshooting, study design, meeting with UM graduate students, and attending the annual meeting in KL. Laing will also help oversee the training of Malaysian graduate students or staff who will visit the USU lab for training on the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA. Laing's salary will increase each year by 3.0%. The research technician, Lianying Yan, will commit 6 months p.a. (Y1-OY5) to this project. In OY5, we request $28,411.22. Yan will help oversee the training of Malaysian graduate students and staff who will visit the USU lab for training in the concepts and practice of viral glycoprotein antigen preparation for use in Luminex and other serological assays such as ELISA.

Fringe Benefits. The fringe rate used is 32.32% for Henry M. Jackson Foundation (HJF).

Equipment. N/A

Travel:
Domestic. N/A

International. We request $11,500 for international travel for Co-PI Broder and postdoctoral student Laing for Y1-OY5. Broder and Laing will travel once per year to Malaysia for training purposes. Individually, yearly trip will total $5,750 ($2,000 airfare + $3,419 ($263*10 days) + 331 misc. travel costs. In Year 3, one Malaysian lab staff member will travel to the USU lab for training for a total of $5,000, ($2,000 + $2,916 ($243*12 days) + $84 misc. travel costs.

Other Direct Costs.
Materials and Supplies. We request $15,000 for Luminex reagent production and consumables, molecular biology reagents for $2,000 and cell culture materials and supplies for $3,000

Indirect Costs. The USU On-site overhead rate of 34.74%, less subawards; additional 14.30%, Company-wide G&A rate is applied on the total direct cost less subaward plus the USU on-site overhead rate. For proposals including subawards, additional 1.0% is applied on total subaward cost. The above indirect cost and fringe benefit rates for FY 2016 were proposed to the USAMRAA on September 11, 2015.

Universiti Putra Malaysia (UPM): Y1

Other Personnel. Key personnel, Dr. Latiffah Hassan, will commit 2.0 months p.a. (Y1-OY5). In Year 1, we request $5,000 salary for 2.0 months p.a. Dr. Hassan will work with Co-PI Mr. Tom Hughes (Conservation Medicine, Ltd.) to coordinate in-country lab and field activities and will be the main contact for personnel at UPM. We will hire a lab technician for Y1-OY5. In Y1, we will only hire the technician for 1 month, at $600 per month, in order to prepare the lab for receiving a Luminex machine and a training workshop in Y2 and to help develop the Farm study. Beginning in Y2, we will request full 12 months of salary through OY5. A PhD student will work full time on this project, beginning in Y1, who will be co-supervised by PI Epstein. For Y1, the PhD student will receive $12,000 for project costs, which include supplies and field costs.

Travel.
Domestic.
In Y1, we request $6,000 for travel. Travel will include transportation costs for Dr. Hassan and the PhD student to and from field sites in Malaysia.

Indirect costs. We are requesting $4,956 (21% of direct costs) for administrative and personnel costs.

Universiti Putra Malaysia (UPM): Y2

Other Personnel. Key personnel, Dr. Latiffah Hassan, will commit 2.0 months p.a.. In Year 2, we request $5,000 salary for 2.0 months p.a. Dr. Hassan will work with Co-PI Mr. Tom Hughes (Conservation Medicine, Ltd.) to coordinate in-country lab and field activities and will be the main contact for personnel at UPM. In Year 2, we request $7,200 for 12 months salary for the lab technician to facilitate the farm study, test livestock samples, and oversee Luminex installation and maintenance at UPM. A PhD student will work on this project from UPM, who will be co-supervised by Dr. Hassan and Dr. Epstein. For Y2, the PhD student will receive $12,000 for project costs, which include supplies and field costs.

Travel.
Domestic.
In Y2, we request $6,000 for travel. Travel will include transportation costs for Dr. Hassan and the PhD student to and from field sites in Malaysia.

Indirect costs. We are requesting $6,342 (21% of direct costs) for administrative and personnel costs.

Universiti Putra Malaysia (UPM): Y3

Other Personnel. Key personnel, Dr. Latiffah Hassan, will commit 2.0 months p.a.. In Year 3, we request $5,000 salary for 2.0 months p.a. Dr. Hassan will work with Co-PI Mr. Tom Hughes (Conservation Medicine, Ltd.) to coordinate in-country lab and field activities and will be the

main contact for personnel at UPM. In Year 2, we request S7,200 for 12 months salary for the lab technician to facilitate the farm study, test livestock samples, and oversee Luminex installation and maintenance at UPM. A PhD student will work on this project from UPM, who will be co-supervised by Dr. Hassan and Dr. Epstein. For Y3, the PhD student will receive $12,000 for project costs, which include supplies and field costs.

Travel.
Domestic.
In Y1-OY5, we request $6,000 for travel. Travel will include transportation costs for Dr. Hassan and the PhD student to and from field sites in Malaysia.

Indirect costs. We are requesting S6,342 (21% of direct costs) for administrative and personnel costs.

Universiti Putra Malaysia (UPM): OY4

Other Personnel. Key personnel, Dr. Latiffah Hassan, will commit 2.0 months p.a. (Y1-OY5). In OY4, we request $5,000 salary for 2.0 months p.a. Dr. Hassan will work with Co-PI Mr. Tom Hughes (Conservation Medicine, Ltd.) to coordinate in-country lab and field activities and will be the main contact for personnel at UPM. In Year 2, we request $7,200 for 12 months salary for the lab technician to facilitate the farm study, test livestock samples, and oversee Luminex installation and maintenance at UPM. A PhD student will work on this project from UPM, who will be co-supervised by Dr. Hassan and Dr. Epstein. For OY4, the PhD student will receive $12,000 for project costs, which include supplies and field costs.

Travel.
Domestic.
In OY4, we request $6,000 for travel. Travel will include transportation costs for Dr. Hassan and the PhD student to and from field sites in Malaysia.

Indirect costs. We are requesting S6,342 (21% of direct costs) for administrative and personnel costs.

Universiti Putra Malaysia (UPM): OY5

Other Personnel. Key personnel, Dr. Latiffah Hassan, will commit 2.0 months p.a. (Y1-OY5). In Option Year 5, we request S5,000 salary for 2.0 months p.a. Dr. Hassan will work with Co-PI Mr. Tom Hughes (Conservation Medicine, Ltd.) to coordinate in-country lab and field activities and will be the main contact for personnel at UPM. In Year 2, we request S7,200 for 12 months salary for the lab technician to test livestock samples from the farm study, facilitate development of new reagents with USU Co-PI Broder, and oversee Luminex maintenance at UPM. A PhD student will work on this project from UPM, who will be co-supervised by Dr. Hassan and Dr. Epstein. For OY5, the PhD student will receive $12,000 for project costs, which include supplies and field costs.

Travel.

Domestic.

In OY5, we request $6,000 for travel. Travel will include transportation costs for Dr. Hassan and the PhD student to and from field sites in Malaysia.

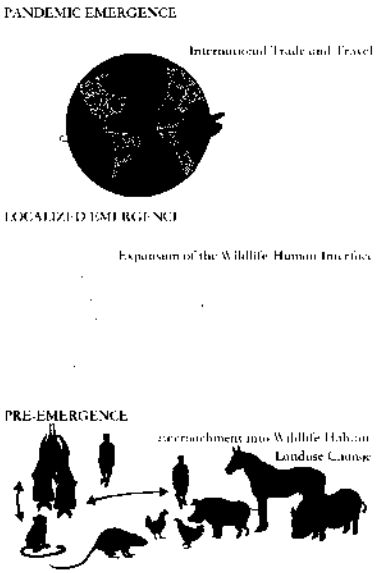
Indirect costs. We are requesting $6,342 (21% of direct costs) for administrative and personnel costs.

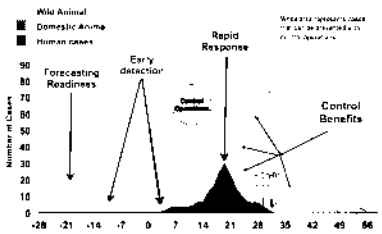
UNCLASSIFIED

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia PI: J.H. Epstein, EcoHealth Alliance, CBEP-TA.6 CC WMD GRANT # 11985842

Objective: To enhance capacity within the Government of Malaysia human and animal health sectors to detect antibodies to all known and novel filoviruses and henipaviruses in wildlife, livestock and people, via active surveillance. This will accelerate detection and response to spillover and emergence events.

Method: Wildlife reservoirs in Malaysia may carry Nipah virus, Ebola virus and potentially unknown related viruses that could threaten livestock and public health. This project brings together partners in wildlife, human health, and agricultural government sectors (One Health) and establishes state-of-the art diagnostics to detect all filoviruses and henipaviruses in wildlife, livestock and people with high animal exposure (e.g. hunting communities & farmers).





surveillance in animals and people at high risk to detect & respond to spillover earlier

Status of effort: Memorandum of Agreement established with three Govt. of Malaysia departments; ongoing active collaboration under USAID PREDICT; biological samples collected from > 900 bat and primate species and 100 people; 22 reagents for filo and henipavirus antibody detection produced and validated.

Personnel Supported: 12 Researchers, 2 University Faculty, 4 Graduate Students, 1 Post-Doctoral Fellow, 5 Scientific Advisors; 3 lab research assistants/techs

Publications & Meetings: >35 peer-reviewed papers 2015 >10 presentations at National and International Science, Medicine, or Policy forums and conferences.

Major Goals and Milestones:

- Enhance local capacity for science & zoonotic disease surveillance Years 1-3 & Option Years 4-5
- Establish multiplexed pan-filovirus & pan-henipavirus serological assays in Govt. of Malaysia labs in wildlife, livestock, and human health sectors Years 1-3.
- Conduct serological surveillance to detect zoonotic pathogens & transmission in humans and animals at high risk interfaces – Years 1-3 & Option Years 4-5

Funding Profile: $816,818 Y1 (10/16-9/17) $820,195 Y2, $718,529 Y3, $729,541 OY4, $681,487 OY5

Contact information PI: Dr. Jonathan H. Epstein +1212-380-4467 Epstein@ecohealthalliance.org

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein
CBEP-Thrust Area 6, CC WMD

Statement of Work

Project Title: Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Document Date: May 2016

Objective: The objective of this project is to enhance capacity within the Malaysia government to characterize the distribution of and detect spillover of novel and known henipaviruses and filoviruses, (both groups include high consequence zoonotic pathogens) in indigenous populations and farms in Peninsular Malaysia. Current surveillance strategies for novel zoonotic viruses rely exclusively on molecular detection tools, but Nipah and Ebola viruses are present at low prevalence in bat species which makes infected individuals difficult to detect. By establishing a multiplexed serological assay developed to detect antibodies against any henipa- and filoviruses, the Government of Malaysia (GoM) will more effectively be able to determine the distribution of these high-impact viruses in wildlife reservoirs and detect evidence of spillover in at-risk human or livestock populations. This enhancement of human and animal surveillance in all three sectors (wildlife, livestock and human health) and training of Malaysian scientists utilizes a One Health approach and will help reduce risk of zoonotic disease emergence and spread by accelerating detection and response. These activities fulfill DTRA CBEP's mandate and are also complementary to and supportive of the aims of the USAID EPT program and the Global Health Security Agenda.

Scope: This research includes transferring state-of-the art serological reagents and Luminex-based microsphere beaded technology that will allow the Government of Malaysia to use a One Health approach to conduct serological surveillance for all known *and unknown* henipaviruses and filoviruses in wildlife, domestic animals, and humans. The study will test archived human and wildlife serum samples which are linked to PCR-tested oral, rectal, or urogenital swab samples (collected and tested under the ongoing USAID Emerging Pandemic Threats: PREDICT program and a University of Malaya study of Orang Asli healthy populations and acutely febrile hospital cases). It will also conduct a new study looking at henipa- and filovirus antibodies in livestock and farm workers and wildlife near the farms, as well as an expanded Orang Asli study focused on hunting communities living in the forest. The grantee will investigate spillover of these pathogens by screening wildlife reservoirs (e.g. bats and nonhuman primates), people, and livestock for IgG antibodies to henipaviruses and filoviruses, while also continuing to develop and transfer additional tests that will detect antibodies against novel viruses in these groups.

Our team will focus on the following major goals and milestones:

1. Improve the Government of Malaysia's capacity to conduct serological surveillance for henipaviruses and filoviruses in human and animal populations, using a One Health approach.
    - Transfer Luminex-based technology into government and university diagnostic labs in three key sectors (wildlife, livestock, and human health); conduct trainings for staff to be able to screen samples, interpret results, and perform confirmatory assays; train local graduate students; and publish and share findings among GoM partners.
2. Determine the host distribution and seroprevalence of henipaviruses and filoviruses in wildlife (e.g. bat) populations in Peninsular Malaysia associated with Orang Asli communities and livestock farms.

- Conduct cross-sectional serological studies of humans and animals for henipa- and filoviruses by testing sera from new samples collected under this project and archived samples from PREDICT. Wildlife sampling will be conducted jointly with the Dept. of Wildlife and National Parks (DWNP); livestock sampling with DVS and UPM; and human sampling with MoH. These activities provide opportunity for One Health-based disease surveillance; threat reduction; and capacity building within the Government of Malaysia.

3. Conduct surveillance for IgG antibodies against filoviruses and henipaviruses in people and domestic animals which may indicate spillover from wildlife reservoirs. Sampling activities will focus on Orang Asli communities and farms in Peninsular Malaysia and will be conducted jointly with the Ministry of Health's National Public Health Laboratory (NPHL), DWNP, and the University Putra Malaysia under the Department of Veterinary Services (DVS). Serological surveillance will allow the GoM to focus limited resources and develop interventions to reduce threat from viral outbreaks in at-risk animal and human populations.

- Qualitative studies (e.g. questionnaires) detailing human-animal contact where sampling occurs will characterize high-risk behaviors and interfaces;
- Sampling human, wildlife, and domestic animal populations in Orang Asli forest communities that practice hunting.
- Sampling domestic animals and farm workers on large and small-scale farms and associated wildlife to identify evidence of spillover.

Our research will be focused on building capacity within the Government of Malaysia to conduct serological surveillance in human and animal populations in Peninsular Malaysia where people and animals are believed to have high levels of contact. Collaborators from the Government of Malaysia (GoM)'s Department of Wildlife and National Parks (DWNP), the Ministry of Health's National Public Health Laboratory (NPHL), the Department of Veterinary Service's University Putra Malaysia (UPM), University of Malaysia (UM), The Uniformed Services University, Maryland (USU), Conservation Medicine, Ltd. (CM), The US Navy Medical Research Center, Asia (NMRC-A), and Duke-NUS Graduate Medical School, Singapore (Linfa Wang lab) will play active roles in this research. EHA's history of successful collaboration with DWNP, MoH, and DVS under prior research projects and most recently through PREDICT, as well as having a Memorandum of Agreement with the aforementioned institutions, gives us confidence that we will be able to achieve the aims of this proposal (also see letters of collaboration).

The duration of the proposed project is three years, with optional 4th and 5th years containing follow-up Orang Asli studies and farm studies so that we have longitudinal data. These option years will significantly strengthen the overall study by enhancing our ability to detect temporal patterns of infection in bat and other animal populations as well as additional opportunity to detect spillover in humans or livestock. **Through these proposed activities we would create enhanced One Health surveillance for known *and novel* henipaviruses and filoviruses in human and animal populations in Peninsular Malaysia, an emerging disease hotspot**. The proposed activities would significantly support Malaysia's surveillance priorities, DTRA CBEP Thrust Area 6 objectives, the Global Health Security Agenda (GHSA), and the USAID Emerging Pandemic Threats program by allowing the Government of Malaysia to more rapidly detect infections of high impact zoonotic agents and develop effective interventions to prevent viral

outbreaks and reduce human and animal mortality, thereby reducing the threat from these high consequence viral agents.

Background:

Nipah virus (NiV), Ebola virus (EBOV) and Marburg Virus (MARV) are emerging zoonotic viruses belonging to the genera *Henipavirus* (Family *Paramyxoviridae*), *Ebolavirus* and *Marburgvirus* (both Family *Filoviridae*) and they have each caused outbreaks in people with high mortality rate. These viruses are listed as a select agents by HHS and USDA as pathogens of significant threat to both human and animal health. Nipah virus (NiV) is a zoonotic paramyxovirus (genus *Henipavirus*) with pandemic potential that first emerged on a pig farm in Malaysia in 1997 and led to a human outbreak with more than 260 cases and 40% mortality. Old world frugivorous bats, particularly Genus *Pteropus* (Family *Pteropodidae*), are natural reservoirs for a range of henipaviruses, including Nipah virus. Filoviruses circulate both in Africa and Southeast Asia, and have also been linked to bat reservoirs. In Africa, EBOV and Sudan virus (SUDV) have caused multiple human outbreaks with mean mortality rates between 50% and 90%. The current EBOV outbreak in West Africa, by far the largest Ebola epidemic in history, has had more than 28,600 cases, primarily in Sierra Leone, Guinea, and Liberia, with a mortality rate of 40%. The outbreak in West Africa has prompted the Government of Malaysia to determine whether filoviruses are circulating in bat species resident in Peninsular Malaysia. Malaysia's experience with Nipah virus, existing technical expertise, and its current commitment to using a One Health approach to disease surveillance (e.g. surveillance for novel zoonoses under PREDICT in all three sectors: wildlife, livestock, and human health) make it an ideal place to establish an advanced serological platform for detection of henipavirus and filovirus antibodies in wildlife and at-risk livestock and human populations.

Preliminary data: Serological studies of Nipah virus and Ebola virus using the Luminex-based platform. Studies conducted by our group have shown that NiV viral prevalence in pteropid bats is low (~1%-3%) and there is temporal variation to shedding. Mean seroprevalence in *P. vampyrus,* which is found across Peninsular Malaysia was 32% (n=253; range 16.7% - 42.4%). In Bangladesh, we conducted a 6-year longitudinal study of *Pteropus giganteus* using the Luminex-based platform to screen bats for IgG antibodies against both Nipah virus and Ebola virus Zaire. Between 20% and 80% of adult *Pteropus giganteus* were NiV seropositive, while between 20% and 50% were EBOV seropositive (Epstein et al, *in prep*). Nipah virus infections appear to peak in June/July while EBOV appears to peak in December (see also Project Narrative). We found a diversity of genetic strains of Nipah virus in *P. giganteus* (Epstein et al., *in prep*), and viruses which are NiV-like but distinct henipaviruses. Non-neutralizing antibodies against NiV-like viruses found in goats, cattle, and pigs in Bangladesh suggests that spillover from bats to domestic animals occurs and that there is a broad spectrum of henipaviruses circulating in bats. RESTV RNA was recently identified by our group in *Mineopterus schreibersii,* a common insectivorous bat. We also detected RESTV antibodies in two fruit bat species: *Cynopterus brachyotis* and *Pteropus vampyrus:* the latter is a NiV reservoir. In Bangladesh, we found antibodies against EBOV and RESTV in 3.5% of *Rousettus leschenaultii* (n=141). *M. schreibersii*, *R. leschenaultii*, and two *Pteropus* species, including *P. vampyrus* all occur in Malaysia, yet there is no data available regarding filoviruses in wildlife in Malaysia. The possibility that multiple henipaviruses or filoviruses capable of infecting people or livestock

to be circulating in bats in Malaysia makes enhanced surveillance and early detection of these high consequence viruses critically important for reducing their threat to public health.

PREDICT
Between 2009 and 2015, EHA, CM, and the Department of Wildlife and National Parks (DWNP) have collected and archived samples, including serum, from more than 1,400, animals including bats, rodents, and macaques all from areas where people and wildlife come into contact. While oropharyngeal, urogenital, and rectal swab samples have been or will be screened using PCR assays for viral families (including paramyxoviruses and filoviruses), corresponding sera remain archived (and untested) and will be made available for this project to test them using the Luminex-based assay.

University Malaya study of acutely ill Orang Asli patients.
We will also have access to archived and newly collected Orang Asli samples collected from acutely febrile patients at Gombak Hospital that serves the Orang Asli communities, under a separate ongoing disease study at the University of Malaya (Prof. Abu Bakar) and NMRC-A (Co-PI Pike). This study just received renewed funding to continue sampling febrile patients and expand to sample asymptomatic Orang Asli from communities across a land-use gradient, which will include individuals without animal exposure. Under this proposal we will screen sera collected from well characterized Orang Asli patients and community members using the Luminex-based platform.

Key references (Further references are available in the Project Narrative):

Luby, S.P., The pandemic potential of Nipah virus. *Antiviral Research*, 2013. 100(1): p. 38-43.

Olival, K.J. and D.T.S. Hayman, Filoviruses in Bats: Current Knowledge and Future Directions. *Viruses*-Basel, 2014. 6(4): p. 1759-1788.

Sarah I. Jayme, et al., Molecular evidence of Ebola Reston virus infection in Philippine bats. *Virology Journal*, 2015. 12(107): p. 1-8.

Sohayati A. Rahman, et al. Risk Factors for Nipah Virus Infection among Pteropid Bats, Peninsular Malaysia. *Emer. Infect. Dis.,* 2013. DOI: 10.3201/eid1901.120221.

***Tasks/Scientific Goals:* (Format: Year #(s). Task #. Sub-task#)**

Task 1: (Year 1-OY5). Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. The GoM has been engaged in using a One-Health approach to zoonotic disease surveillance since the NiV outbreak in 1998 and most recently via collaborations with EHA under PREDICT. However, current GoM and PREDICT surveillance activities in humans, wildlife and domestic animals are based on broad molecular assays designed to identify novel viruses (including henipaviruses and filoviruses). One of the challenges with this approach is that Nipah, Ebola, and related viruses tend to be acute and asymptomatic infections in bats, making detection of viral RNA challenging. IgG antibodies,

however, persist in bats (as well as people and livestock), reducing the sampling effort necessary to identify exposed or infected individuals in a population and also allowing for detection of asymptomatic carriers. Adding a serological component to existing surveillance will greatly enhance the government's ability to detect both known and unknown henipa- and filoviruses in wildlife, domestic animals and human populations at risk for spillover. To establish this capacity, we will provide a BioRad Bio-Plex 200 machine with computer console to NPHL and DWNP. We will provide all reagents for henipa- and filovirus assays. Following Bio-Plex installation, we will conduct a 10-day training course for lab technicians at DWNP and another at NPHL. UM has a Luminex machine and will receive assay reagents and lab staff will participate in one of the training workshops. 1 PhD student at USU will develop additional assay reagents in Y1-OY5. We will identify *either* 1 PhD or 2 Masters' students at UM and 1 PhD student at UPM to train under this project. We will provide additional training to technical staff from GoM partner labs in viral pseudo-type assay development at USU. The grantee shall:

1.1.1. Transfer BioRad Bio-Plex 200 to NPHL and DWNP labs;

1.1.2-2.1.2. Transfer Luminex-based filovirus and henipavirus reagents to DWNP, NPHL, and UM labs; the grantee will provide a BioRad Bio-Plex 200 to UPM and conduct a 10-day training workshop in Y2.

1.1.3.-2.1.3 Train lab staff to use Luminex-based assays

1.1.4- OY5.1.4 Supervise 1 UM PhD or 2 Masters' students (Y1-3), and 1 UPM PhD student

1.1.5-OY5.1.5 Convene the Science Advisory Group (annually in KL);

1.1.6-2.1.6 Develop a database for serology results and sample metadata; establish sample repository at partner labs.

Task 2. (Y1-OY5) Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. At USU, we will engineer soluble and secreted versions of henipa- and filovirus glycoproteins, expressed in mammalian cell culture systems to accurately reflect proper synthesis including their assembly and processing into properly glycosylated higher order complexes. Constructs will be designed and tested in pilot experiments for expression and analysis, and then used to establish stably expressing cell lines. Preparative amounts of the various soluble viral glycoproteins will be made using serum-free culture conditions in suspension culture, and proteins are purified using the appropriate tag protocol (either S-tag or double strep tag (TST)) by affinity chromatography, followed by concentration and size exclusion chromatography. We will test the utility of each individual glycoprotein by Luminex, ELISA and Western blotting then provide all necessary reagents to partner labs to accomplish the testing under this project. The grantee shall:

1.2.1-2.2.1 produce Mojaing virus (MojV) and African GH-M74a G glycoproteins; Bundibugyo virus (BDBV), Tai Forest virus (TAFV), Lloviu virus (LLOV), MARV Ravn, SUDV, SUDV GpΔmucin, RESTV (monkey), and RESTV (porcine) Gp glycoproteins.

1.2.2-3.2.2 use the completed viral glycoprotein preparations and produce polyclonal rabbit serum to each individual glycoprotein; test the utility of each individual glycoprotein by Luminex-based, ELISA and Western blotting assays;

1.2.3 Provide N protein reagents to detect novel henipa- and filoviruses to partner labs.

1.2.4-OY5.2.4: If novel henipa- or filoviruses are detected using molecular assays (under

PREDICT), grantee may develop new reagents for antibodies against these viruses and negative sera will be re-screened.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform (Y1-Y2). Grantee shall test up to 945 macaque and 175 bat archived serum samples collected under PREDICT and stored at DWNP, and up to 300 archived Orang Asli samples stored at NPHL, and up to 200 Orang Asli samples at UM. The number of samples will depend on available serum volume and quality. Results will be used to inform the Orang Asli and farm studies described in **Tasks 4 and 5**. Positive sera may be sent for confirmatory testing at USU using pseudovirus serum neutralization assays, ELISA, or Western blot. Results shall be entered into a database and shared with GoM partners.

1.3.1 Identify suitable archived animal and human sera;
1.3.2 Screen sera for henipa- and filovirus IgG antibodies at GoM and UM partner labs;
1.3.3 Confirm positive results using western blot or pseudovirus assay;
1.3.4 Enter results into database and analyze;
1.3.5-2.3.5 share results with partners.

Task 4. Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. (Y1-OY5). Indigenous communities living in forested areas and that practice subsistence wildlife hunting are at higher risk of exposure to zoonotic viruses due to handling and butchering wildlife and therefore contact with bodily fluids. In **Y1** of this project, we will apply for IRB ethical approval to continue and expand from a pilot study currently underway (expected completion: Oct 2016). Pending IRB and IACUC approval, CM, MoH, and DWNP will work together in **Y1-Y2** to sample 100 individuals from each of 3 Orang Asli communities in Perak State (incl. Kuala Lipis and Gua Musang), **totaling 600 human blood samples over five years**. 100 people sampled per community will allow us to detect a seropositive individual with 95% confidence at a prevalence of 3%, assuming a population of 500 individuals. We will also aim to sample blood from 50 bats per each of 3 species around each study village (e.g. *Miniopterus*, *Pteropus*, and *Rousettus* spp); 30 nonhuman primates; and 30 dogs, if present, in order to be able to detect henipa- or filovirus antibodies in an individual with 95% confidence given a 5% seroprevalence (in bats) and 10% in dogs and nonhuman primates. MOH officers and CM will collect blood from Orang Asli and associated animals, and serum will be separated either in the field or at partner labs and stored at -86C at prior to testing. A sample size of 50 bats would allow us to detect differences between study locations (or time points, should we conduct follow-up studies) of 56% with 95% confidence and 80% precision. The grantee shall conduct repeated sampling of Orang Asli and peri-domestic livestock and wildlife in the same communities in Y3-OY4. If novel henipa or filoviruses identified by PREDICT, new assays will be developed in OY4 and negative samples re-tested. Molecular and serological data from Orang Asli will be co-analyzed in OY4-OY5. In addition, we will test sera collected through an ongoing UM study of Orang Asli. Up to 500 samples per year will be collected Y1-OY5, and these will be tested using the Luminex-based platform at UM. Positive samples will be confirmed at UM or USU.
The grantee shall:

1.4.1.-OY5.4.1 Test Orang Asli, wildlife, and peri-domestic animal samples collected under PREDICT and UM studies
1.4.2-2.4.2, Y3.4.2, OY4.4.2-OY5.4.2. Enter results into database and analyze data;
1.4.3 – 2.4.3, Y3.4.3, OY4.4.3 Confirm sero-positive samples;

1.4.4. Develop follow-up study with GoM partners to be implemented in Y3.
2.4.5 Apply for IRB and permits for follow-up study
3.4.6 Implement repeated sampling in Orang Asli villages
3.4.7 Analyze longitudinal data
OY4.4.1. If new viruses found by PREDICT, develop new sero assay and re-test samples
OY4.4.2.-OY5.4.2 Confirm additional test results and co-analyze molecular and sero data

Task 5. Develop serological study of farm workers, livestock, and wildlife around farms. (Y1-OY5) Grantee shall conduct a serological survey of farm workers and animals living on or around 2 large-scale farms (>5000 ruminants and/or pigs) and 2 small-scale farms (500-1000 ruminants and/or pigs) in Peninsular Malaysia to detect exposure to henipa- or filoviruses. Grantee shall work with DWNP to sample bats, macaques and dogs proximal to farms; and with MoH to conduct qualitative research and collect blood samples from farm workers to screen for henipa- and filovirus antibodies. Grantee will work with UPM to sample and test livestock. In Y1 grantee will select appropriately sized farms. Grantee shall also locate bat caves or roosts proximal to each farm, meet farm owners, and characterize the livestock. Grantee shall apply for all necessary IRB and IACUC approvals. Grantee may commence sampling in Y2, pending approvals, and conduct a follow-up study in OY4 and OY5 (if funded). The grantee shall:

1.5.1 Meet with GoM partners to develop study;
1.5.2 Apply for ethical approvals and permits.
1.5.3. Conduct scoping visits to farms, characterize livestock and local wildlife species.
2.5.1-3.5.1 Collect wildlife, livestock, and human samples
2.5.2-3.5.2 Conduct questionnaires with farm workers
2.5.3-3.5.3 Screen samples using Luminex-based assay; confirm results
2.5.4-3.5.4 Enter data into database and analyze results
OY4.5.1-5.5.1 Repeat human, wildlife and livestock sampling at each farm
OY4.5.2-OY5.5.2 Test samples, enter results into database; analyze complete dataset
OY5.5.3 prepare manuscript based on (Y1-OY5) study

Task 6. Disseminate reports to relevant stakeholders (Y1-OY5). Grantee shall synthesize all data collected through the projects described above as well as capacity building activities in Malaysia. Scientific and general reports will be generated and provided to GoM partners and an annual report to DTRA. PhD or Masters' students will complete thesis and present at annual stakeholders meeting in KL or at scientific meeting in Malaysia. Grantee shall meet with GoM partners and SAG in Kuala Lumpur annually, according to schedule. Grantee shall present findings at scientific meetings (e.g. ASTM, ASM Biodefense, IMED, EcoHealth) to present findings according to the schedule.

1.6.1-OY5.6.1 submit progress reports to DTRA.
1.6.2-OY5.6.2 Complete annual report to local stakeholders.
1.6.3-OY5.6.3 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.6.4-OY5.6.4 Conduct annual stakeholder meetings.
3.6.5. Prepare comprehensive project report for GoM
3.6.7, OY5.6.7 UM Graduate students present thesis to committee and prepare publication in peer reviewed journal
3.6.6-OY5.6.6 Prepare and submit publications to disseminate study findings.

Project Timeline

Task	Y1	Y2	Y3	OY4	OY5
1. Enhance capacity in Malaysia for serological surveillance for all henipaviruses and filoviruses					
1.1. Transfer BioRad Bio-Plex 200 in NPHL, DWNP, and UPM labs					
1.2 Transfer serological reagents to NPHL, DWNP, UPM, and UM labs					
1.3 Training staff at partner labs					
1.4 Identify graduate students at UM and UPM					
1.5 Convene Science Advisory Group					
1.6 Develop database for serology results and sample metadata					
1.7 Training in pseudovirus development at USU					
2. Develop & validate henipavirus and filovirus reagents.					
2.1 Produce specific henipavirus and filovirus proteins					
2.2 Produce and test monoclonal antibodies against new proteins					
2.3 Transfer henipa and filo N protein assays to partner labs					
2.4. develop/validate proteins and mAbs for novel henipa- & filoviruses					
3.Screen archived wildlife and Orang Asli sera					
3.1 Identify archived wildlife and human sera at NPHL and DWNP					
3.2 Screen sera using Luminex-based platform					
3.3 Confirm positive sera with additional testing					
3.4 Enter results in database / analyze					
4. Sero-survey of Orang Asli and animals					
4.1 apply for IRB/IACUC approval					
4.2 Collect & test serum samples from Orang Asli ~ animals					
4.3 Enter results into database					
4.4 Confirm positive sera with additional testing					
4.5 Conduct follow-up study of Orang Asli and animals					
4.6 Analyze data					
5. Serological study of farm workers, livestock, and wildlife on farms	■	■	■	■	■
5.1 Apply for necessary permits and ethical approval	■	■			
5.2 scoping visits to potential study farms; select farms	■				
5.3 sample farm workers, livestock, and wildlife on farms		■	■		
5.4 follow-up study of farm workers, wildlife and livestock (4 farms)				■	■
5.5 Enter results into database / analyse results		■	■	■	■
6. Disseminate reports to relevant stakeholders					
6.1 annual report toDTRA					
6.2 annual report to government of Malaysia partners					
6.3 attend DTRA annual technical review					
6.4 partner meeting in Malaysia					
6.5 present results at scientific conference (e.g. ASTMH, IMED, ASM)					
6.6 prepare manuscripts for publication in peer-reviewed journal					

OMB Number: 4040-0001
Expiration Date: 6/30/2016

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION

☐ Pre-application ☐ Application ☒ Changed/Corrected Application

2. DATE SUBMITTED 05/24/2016

Applicant Identifier

4. a. Federal Identifier

b. Agency Routing Identifier GRANT11985842

c. Previous Grants.gov Tracking ID GRANT12170775

5. APPLICANT INFORMATION

Organizational DUNS: 077090060000

Legal Name: EcoHealth Alliance

Department:

Division:

Street1: 460 W 34th Street 17th Floor

Street2:

City: New York

County / Parish:

State: NY: New York

Province:

Country: USA: UNITED STATES

ZIP / Postal Code: 100012317

Person to be contacted on matters involving this application

Prefix: Dr.

First Name: Jonathan

Middle Name: H

Last Name: Epstein

Suffix:

Position/Title: Associate Vice President, Conservation Med.

Street1: 460 W 34th Street 17th Floor

Street2:

City: New York

County / Parish:

State: NY: New York

Province:

Country: USA: UNITED STATES

ZIP / Postal Code: 100012317

Phone Number: 2123804467

Fax Number:

Email: epstein@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION *(EIN) or (TIN):* 311726494

7. TYPE OF APPLICANT: M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Other (Specify):

Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION:

☐ New ☒ Resubmission

☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).

☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration

☐ E. Other (specify):

Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. NAME OF FEDERAL AGENCY: Defense Threat Reduction Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 12.351

TITLE: Basic Scientific Research: Combating Weapons of Mass Destruction

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

12. PROPOSED PROJECT:

Start Date: 10/01/2016

Ending Date: 09/30/2021

13. CONGRESSIONAL DISTRICT OF APPLICANT 10

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name: Jonathan Middle Name: H

Last Name: Epstein Suffix:

Position/Title: Associate Vice President, Conservation Med.

Organization Name: Ecohealth Alliance

Department: Division:

Street1: 460 W 34th Street 17th Floor

Street2:

City: New York County / Parish:

State: NY: New York Province:

Country: USA: UNITED STATES ZIP / Postal Code: 100012317

Phone Number: 2123804467 Fax Number:

Email: epstein@ecohealthalliance.org

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	3,766,569.82
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	3,766,569.82
d. Estimated Program Income	0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:

DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR

☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ **I agree**

**The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL (Disclosure of Lobbying Activities) or other Explanatory Documentation

Add Attachment

19. Authorized Representative

Prefix: Mr. First Name: Aleksei Middle Name:

Last Name: Chmura Suffix:

Position/Title: Authorized Organizational Representative

Organization: Ecohealth Alliance

Department: Division:

Street1: 460 W 34th Street 17th Floor

Street2:

City: New York County / Parish:

State: NY: New York Province:

Country: USA: UNITED STATES ZIP / Postal Code: 100012317

Phone Number: 2123804475 Fax Number:

Email: chmura@ecohealthalliance.org

Signature of Authorized Representative: Aleksei Chmura

Date Signed: 05/24/2016

20. Pre-application Add Attachment

21. Cover Letter Attachment Add Attachment

RESEARCH & RELATED Other Project Information

OMB Number: 4040-0001
Expiration Date: 6/30/2016

1. Are Human Subjects Involved? ☒ Yes ☐ No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6

If no, is the IRB review Pending? ☒ Yes ☐ No

IRB Approval Date:

Human Subject Assurance Number:

2. Are Vertebrate Animals Used? ☒ Yes ☐ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☒ Yes ☐ No

IACUC Approval Date:

Animal Welfare Assurance Number:

3. Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. Does this Project Have an Actual or Potential Impact - positive or negative - on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. Does this project involve activities outside of the United States or partnerships with international collaborators? ☒ Yes ☐ No

6.a. If yes, identify countries: Malaysia, Singapore

6.b. Optional Explanation:

7. Project Summary/Abstract 1235-DTRA_Malaysia_ProjectSummary_EHA | Delete Attachment | View Attachment

8. Project Narrative 1236-DTRA_Malaysia_Fullscientificprop | Delete Attachment | View Attachment

9. Bibliography & References Cited | Add Attachment

10. Facilities & Other Resources | Add Attachment

11. Equipment | Add Attachment

12. Other Attachments Add Attachments

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Project Director/Principal Investigator

Prefix: Dr. * First Name: Jonathan Middle Name: H

* Last Name: Epstein Suffix:

Position/Title: Associate Vice President, Conservation Med. Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th Street 17th Floor

Street2:

* City: New York County:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 100012317

* Phone Number: 2123804467 Fax Number:

* E-Mail: epstein@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** PD/PI **Other Project Role Category:**

*** Attach Biographical Sketch** 1244-Epstein_Biosketch_DTRA_Y Delete Attachment View Attachment

Attach Current & Pending Support 1245-Epstein_CurrentPending_D Delete Attachment View Attachment

PROFILE - Senior/Key Person 1

Prefix: Mr. * First Name: Thomas Middle Name:

* Last Name: Hughes Suffix:

Position/Title: Department:

Organization Name: Conservation Medicine, Ltd. Division:

* Street1: Suite 4A Level 4 Main Office Tower, Financial Park Comp

Street2:

* City: Jalan Merdeka County:

* State: Province:

* Country: MYS: MALAYSIA * Zip / Postal Code: 87000

* Phone Number: 60193928307 Fax Number:

* E-Mail: tom.hughes@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

*** Attach Biographical Sketch** 1246-Hughes_Biosketch_DTRA_Ma Delete Attachment View Attachment

Attach Current & Pending Support 1247-Hughes_CurrentPending_DT Delete Attachment View Attachment

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Senior/Key Person 2

Prefix: Dr. * First Name: Christopher Middle Name:

* Last Name: Broder Suffix:

Position/Title: Director, Emerging Inf. Diseases Grad. Prog. Department:

Organization Name: Uniformed Services University of the Health Sciences Division:

* Street1: 4301 Jones Bridge Road

Street2:

* City: Bethesda County:

* State: MD: Maryland Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 208144799

* Phone Number: 3012953401 Fax Number:

* E-Mail: christopher.broder@usuhs.edu

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

*** Attach Biographical Sketch** 1248-Broder_Biosketch_DTRA_Ma Delete Attachment View Attachment

Attach Current & Pending Support 1249-Broder_CurrentPending_DT Delete Attachment View Attachment

PROFILE - Senior/Key Person 3

Prefix: Dr. * First Name: Brian Middle Name:

* Last Name: Pike Suffix:

Position/Title: Naval Emerging Infectious Disease Department Department:

Organization Name: Naval Medical Research Center - Asia Division:

* Street1: PSC 470 Box 4200

Street2:

* City: FPO AP County:

* State: Province:

* Country: SGP: SINGAPORE * Zip / Postal Code: 965342800

* Phone Number: 6567512229 Fax Number:

* E-Mail: brian.pike@fe.navy.mil

Credential, e.g., agency login:

*** Project Role:** Co PD/PI **Other Project Role Category:**

*** Attach Biographical Sketch** 1250-PIKE_Biosketch_DTRA_Mala Delete Attachment View Attachment

Attach Current & Pending Support 1251 PIKE_DTRA_CurrentPending Delete Attachment View Attachment

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Senior/Key Person 4

Prefix: Mr. * First Name: Gary Middle Name:

* Last Name: Crameri Suffix:

Position/Title: Research Scientist Department:

Organization Name: CSIRO Australian Animal Health Laboratory Division:

* Street1: 5 Portarlington Road

Street2:

* City: Geelong County:

* State: Province: Victoria

* Country: AUS: AUSTRALIA * Zip / Postal Code:

* Phone Number: N/A Fax Number:

* E-Mail: gary.crameri@csiro.au

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

*** Attach Biographical Sketch**	1252-Crameri_Biosketch_DTRA_M		Delete Attachment	View Attachment
Attach Current & Pending Support		Add Attachment		

ADDITIONAL SENIOR/KEY PERSON PROFILE(S)		Add Attachment		
Additional Biographical Sketch(es) (Senior/Key Person)		Add Attachment		
Additional Current and Pending Support(s)		Add Attachment		

OMB Number: 4040-0001
Expiration Date: 6/30/2016

Jonathan H. Epstein
EcoHealth Alliance, 460 W 34th Street, 17th Floor, New York, NY 10001
Epstein@ecohealthalliance.org

Professional Preparation

Brandeis University	Waltham, MA	Biology	BA, 1996
Tufts University, Sch. Vet Med	Grafton, MA	Wildlife Med. Intl Med	DVM, 2002
Tufts University, Sch. of Medicine	Boston, MA	Epidemiology	MPH, 2002

Appointments

Scientific Advisor, Center for Health and Global Envir. Harvard Univ.	2014 – Present
Associate Vice President, Conservation Med Prog, EcoHealth Alliance (EHA)	2009 – Present
Executive Director, Consortium for Conservation Medicine, EHA	2009 – Present
Research Fellow, Center for Infection and Immunity, Columbia Univ.	2007 – 2011
Adjunct Clin Ass. Prof. Tufts Cummings Sch. Vet. Med. & Med Sch.	2003 – Present
Adjunct professor; Columbia University Earth Institute	2003 – Present
Senior Research Scientist, EcoHealth Alliance, NY	2003 – 2009

Publications (out of > 60; *= corresponding author)

Anthony, SJ., Islam, A, Johnson, C, Navarrete-Macias, I., Liang, E., Jain, K., Hitchens, P.L., Che, X., Soloyvov, A., Hicks, A.L., Ojeda-Flores, R., Zambrana-Torrelio, C., Ulrich, W., Rostal, M.K., Petrosov, A., Garcia, J., Haider, N., Wolfe, N., Goldstein, T., Morse, S.S., Rahman, M., **Epstein, JH**, Mazet, J.K., Daszak, P., Lipkin, W.I. Non-random patterns in viral diversity ***Nat. Commun***. 6:8147 doi: 10.1038/ncomms9147 (2015).

Jayme, S., Field, H.E., de Jong, C., Olival, K.J., Marsh, G., Tagtag, A., Hughes, T., Bucad, A., Barr, J., Azul, R., Retes,L., Foord, A., Yu, M., Cruz, M., Santos, I., Catbagan, D., Lim, M., Benigno, C., Epstein, J.H., Wang, LF., Daszak, P., Newman, S. Molecular evidence of Ebola Reston virus infection in Philippine bats. ***Virology Journal*** 2015 12:107

Mandl Judith N, Ahmed R, Barreiro Luis B, Daszak P, **Epstein JH**, Virgin Herbert W, et al. Reservoir Host Immune Responses to Emerging Zoonotic Viruses. (2014) ***Cell.*** 160(1):20-35. 10.1016/j.cell.2014.12.003

Ge X-Y, Li J-L, Yang X-L, Chmura AA, Zhu G, **Epstein JH**, Mazet JK, Hu B, Zhang W, Peng C, Zhang Y-J, Luo C-M, Tan B, Wang N, Zhu Y, Crameri G, Zhang S-Y, Wang L-F, Daszak P, Shi Z-L. (2013). First isolation and characterization of bat SARS-like Coronaviruses that use the ACE2 receptor. ***Nature*** doi:10.1038/nature12711

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Epstein, J.H.*, Quan, P.L., Briese, T., Street, C., Jabado, O., Conlan, S., Khan, S.A., Verdugo, D., Hossain, M.J., Hutchison, S.K., Egholm, M., Luby, S.P., Daszak, P., & Lipkin, W.I. (2010). Identification of GBV-D, a Novel GB-like Flavivirus from Old World Frugivorous Bats (*Pteropus giganteus*) in Bangladesh. ***PLoS Pathogens*** 6(7): e1000972. doi:10.1371/journal.ppat.1000972.

Li, W., Shi, Z., Yu, M., Ren, W., Smith, C.S., **Epstein, J.H.**, Wang, H., Crameri, G., Hu, Z., Zhang, H., Jianhong, Z., McEachern, J., Field, H.E., Daszak, P., Zhang, S., Eaton, B.T. & Wang, L.-F. (2005). Bats are natural reservoirs of SARS-like coronaviruses. ***Science***, 2005 310:676-679.

Statement of Current and Pending Support

EPSTEIN CURRENT SUPPORT

- USAID – "PREDICT 2" - $21,000,000 – (10/01/14-09/30/19)
- USAID – "Infectious Disease Emergence & Economics of Altered Landscapes" - $1,999,203 – (10/15/13-10/14/16)
- NIH – "Understanding the Risk of Bat Coronavirus" - $3,086,735 – (06/01/14-05/31/19)
- NSF – "EcoHealthNet 2.0 – A One Health Approach to disease ecology research & education" - $500,000 – (09/01/16-08/30/19)

EPSTEIN PENDING SUPPORT

- DTRA – "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* in Rural Communities in Uttar Pradesh, India" - $2,441,111.80 – (10/01/2016-09/30/2019)

Thomas Hughes
(b)(6)
E-mail: tom.hughes@ecohealthalliance.org

Professional Preparation

Esher College, Surrey UK	Biology, Geography, History	3A Levels	1998
University of East Anglia, Norwich, UK	Development Studies & Nat. Res.	BSc	2002
Capel Manor College, UK	Horticulture/ Arboriculture	City & Guilds	2003
London School of Hygiene & Trop Med., University of London, UK	Public Health	Post Graduate Diploma	2009

Appointments

Director, Conservation Medicine Ltd	2014 – Present
Deputy Chief of Party, EcoHealth Alliance: IDEEAL project	2013 – Present
Deep Forest Country Coordinator, EcoHealth Alliance: PREDICT program	2012 – Present
PREDICT Country Coordinator, EcoHealth Alliance: PREDICT program	2010 – Present
Project Coordinator Malaysia, EcoHealth Alliance	2007 – Present
Field Officer, EcoHealth Alliance	2005 – 2007

Publications (out of 14)

Sarah Jayme, Hume E. Field, Carol de Jong, Kevin J. Olival, Glenn Marsh, Anson Tagtag, **Tom Hughes**, Anthony Bucad, Jennifer Barr, Rachel Azul, Lilia Retes, Adam Foord, Meng Yu, Magdalena Cruz, Imelda Santos, Davinio Catbagan, Mundita Lim, Carolyn Benigno, Jonathan H. Epstein, Lin-Fa Wang, Peter Daszak and Scott Newman. Molecular evidence of Ebola Reston virus infection in Philippine bats. Virology Journal. 2015, 12:107. DOI: 10.1186/s12985-015-0331-3

Mei-Ho Lee, Melinda K. Rostal, **Tom Hughes**, Frankie Sitam, Chee-Yen Lee, Jeffrine Japning, Mallory E. Harden, Anthony Griffiths, Misliah Basir, Nathan D. Wolfe, Jonathan H. Epstein, Peter Daszak. Macacine Herpesvirus 1 in Long-Tailed Macaques, Malaysia, 2009–2011. Emerging Infectious Disease. DOI: 10.3201/eid2107.1401622015 Jul.

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Sohayati A. Rahman, Latiffah Hassan, Jonathan H. Epstein, Zaini C. Mamat, Aziz M. Yatim, Sharifah S. Hassan, Hume E. Field, **Tom Hughes**, Justin Westrum, M.S. Naim, Arshad S. Suri, A. Aziz Jamaluddin, Peter Daszak, and the Henipavirus Ecology Research Group. Risk Factors for Nipah Virus Infection among Pteropid Bats, Peninsular Malaysia. EMERGING INFECTIOUS DISEASES • www.cdc.gov/eid • Vol. 19, No. 1, January 2013.

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Pulliam JRC, Epstein JH, Dushoff J, Rahman SA, Bunning M, Jamaluddin AA, Hyatt AD, Field HE, Dobson AP, Daszak P, and the Henipavirus Ecology Research Group (**Hughes**). Agricultural intensification, priming for persistence and the emergence of Nipah virus: a lethal bat-borne zoonosis. JOURNAL OF THE ROYAL SOCIETY INTERFACE. 2012 Jan; 9, 89-101 first published online 1 June 2011.

Rahman SA, Hassan SS, Olival KJ, Mohamed M, Chang LY, Hassan L, Saad NM, Shohaimi SA, Mamat ZC, Naim MS, Epstein JH, Suri AS, Field HE, Daszak P; Henipavirus Ecology Research Group (**Hughes**). Characterization of Nipah virus from naturally infected Pteropus vampyrus bats, Malaysia.

Christopher C. Broder, Ph.D.
Uniformed Services University, Microbiology, 4301 Jones Bridge Road, Bethesda, Maryland 20814-4799
E-mail: christopher.broder@usuhs.edu

Professional Preparation

Florida Institute of Technology, Melbourne, Florida	Biological Sciences	B.S.	1983
Florida Institute of Technology, Melbourne, Florida	Molecular Biology	M.S.	1985
University of Florida, Gainesville, Florida	Microbiology&Immunology	Ph.D.	1989

Appointments

Director, Emerging Infectious Diseases Graduate Program, USUHS	2006 – Present
Professor, Department of Microbiology, USUHS.	2005 – Present
Associate Professor, Department of Microbiology, USUHS.	2000 – 2005
Assistant Professor, Department of Microbiology, USUHS.	1996 – 2000
Research Fellow, Laboratory of Viral Diseases, NIAID, NIH.	1990 – 1996

Publications (selected out of over 150; total citations >15,500)

Bossart, KN, G Crameri, AS Dimitrov, BA Mungall, YR Feng, JR Patch, A Choudhary, LF Wang, BT Eaton, and CC Broder. Receptor binding, fusion inhibition, and induction of cross-reactive neutralizing antibodies by a soluble G glycoprotein of Hendra Virus. **J.Virol.** 79(11):6690-702. 2005.

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Brian L. Pike
Naval Medical Research Center – Asia, PSC 470 Box 4200, FPO, AP 96534
Email: brian.pike@fe.navy.mil

Professional Preparation

Tusculum College, Greeneville, TN	Biology	B.A.	1995
U. Southern California, Los Angeles, CA	Molecular Biology	Ph.D.	2006
Johns Hopkins University, Baltimore, MD	Public Health	M.P.H.	2007
U. California L.A., Los Angeles, CA	Epidemiology	Post-Doc	2008

Appointments

Head, Emerging Infectious Disease Department, NMRC-Asia	2013 – Present
Assistant Professor, Emory University School of Medicine	2010 – 2011
Technical Expert, National Biodefense Analysis and Countermeasures Center	2009
Fellow, NIH Fellowship Program in Genetics, Cellular and Molecular Biology	2003 – 2005
Fellow, NIH Intramural Research Training Award Fellowship Program	1995 – 1996

Publications (out of 26)

Rich SM, Leendertz FH, Xu G, Lebreton M, Djoko CF, Aminake MN, Takang EE, Diffo JL, PIKE BL, Rosenthal BM, Formenty P, Boesch C, Ayala FJ, Wolfe ND. The origin of malignant malaria. *Proc Natl Acad Sci.* 2009 Aug 3

Zheng H, Wolfe ND, Sintasath DM, Tamoufe U, Lebreton M, Djoko CF, Diffo Jle D, PIKE BL, Heneine W, Switzer WM. Emergence of a novel and highly divergent HTLV-3 in a primate hunter in Cameroon. Virology. 2010 Jun 5;401(2):137-45. Epub 2010 Mar 30.

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Rimoin AW, Mulembakani PM, Johnston SC, Lloyd Smith JO, Kisalu NK, Kinkela TL, Blumberg S, Thomassen HA, PIKE BL, Fair JN, Wolfe ND, Shongo RL, Graham BS, Formenty P, Okitolonda E, Hensley LE, Meyer H, Wright LL, Muyembe JJ. Major increase in human monkeypox incidence 30 years after smallpox vaccination campaigns cease in the Democratic Republic of Congo. Proc Natl Acad Sci U S A. 2010 Sep 14;107(37):16262-7.

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PIKE BL, Guerry P, Poly F. Global Distribution of Campylobacter jejuni Penner Serotypes: A Systematic Review. PLoS One. 2013 Jun 27;8(6):e67375.

PIKE BL, Porter CK, Sorrell TJ, Riddle MS. Acute Gastroenteritis and the Risk of Functional Dyspepsia: A Systematic Review and Meta-Analysis. Am J Gastroenterol. 2013 May 28. doi: 10.1038/ajg.2013.147.

PIKE BL, Paden KA, Alcala AN, Jaep KM, Gormley RP, Maue AC, Christmann BS, Elson CO, Riddle MS, Porter CK. Immunological Biomarkers in Postinfectious Irritable Bowel Syndrome. J Travel Med. 2015 Jul;22(4):242-50. doi: 10.1111/jtm.12218. Epub 2015 Jun 8.

Gary Crameri
CSIRO Australian Animal Health Laboratory, 5 Portarlington Road, Geelong, Victoria, Australia.
E-mail: gary.crameri@csiro.au

Professional Preparation

Deakin University, Australia	Biological Sciences	BSc	1993

Appointments

Research Scientist, CSIRO Australian Animal Health Laboratory	1984 – Present

Publications (out of 73)

Ge XY, Li JL, Yang XL, Chmura AA, Zhu G, Epstein JH, Mazet JK, Hu B, Zhang W, Peng C, Zhang YJ, Luo CM, Tan B, Wang N, Zhu Y, **Crameri G**, Zhang SY, Wang LF, Daszak P, Shi ZL Isolation and characterization of a bat SARS-like coronavirus that uses the ACE2 receptor. **Nature**. 2013 Oct 30.

Li W, Shi Z, Yu M, Ren W, Smith C, Epstein JH, Wang H, **Crameri G**, Hu Z, Zhang H, Zhang J, McEachern J, Field H, Daszak P, Eaton BT, Zhang S, Wang LF. Bats are natural reservoirs of SARS-like coronaviruses. **Science**. 2005 Oct 28;310(5748):676-9.

Peel AJ, Sargan DR, Baker KS, Hayman DT, Barr JA, **Crameri G**, Suu-Ire R, Broder CC, Lembo T, Wang LF, Fooks AR, Rossiter SJ, Wood JL, Cunningham AA. Continent-wide panmixia of an African fruit bat facilitates transmission of potentially zoonotic viruses **Nat Commun**. 2013; 4:2770

Bonaparte MI, Dimitrov AS, Bossart KN, **Crameri G,** Mungall BA, Bishop KA, Choudhry V, Dimitrov DS, Wang LF, Eaton BT, Broder CC. Ephrin-B2 ligand is a functional receptor for Hendra virus and Nipah virus. **Proc Natl Acad Sci** USA. 2005 Jul 26;102(30):10652-7.

Zhang G, Cowled C, Shi Z, Huang Z, Bishop-Lilly KA, Fang X, Wynne JW, Xiong Z, Baker ML, Zhao W, Tachedjian M, Zhu Y, Zhou P, Jiang X, Ng J, Yang L, Wu L, Xiao J, Feng Y, Chen Y, Sun X, Zhang Y, Marsh GA, **Crameri G**, Broder CC, Frey KG, Wang LF, Wang J. Comparative analysis of bat genomes provides insight into the evolution of flight and immunity. **Science**. 2013 Jan 25;339(6118):456-60

Chua KB, **Crameri G**, Hyatt A, Yu M, Tompang MR, Rosli J, McEachern J, Crameri S, Kumarasamy V, Eaton BT, Wang LF. A previously unknown reovirus of bat origin is associated with an acute respiratory disease in humans. **Proc Natl Acad Sci** USA. 2007 Jul 3;104(27):11424-9.

Baker KS, Leggett RM, Bexfield NH, Alston M, Daly G, Todd S, Tachedjian M, Holmes CE, **Crameri GS**, Wang LF, Heeney JL, Suu-Ire R, Kellam P, Cunningham AA, Wood JL, Caccamo M, Murcia PR. Metagenomic study of the viruses of African straw-coloured fruit bats: Detection of a chiropteran poxvirus and isolation of a novel adenovirus. **Virology**. 2013 Apr 4

Olival KJ, Islam A, Yu M, Anthony SJ, Epstein JH, Khan SA, Khan SU, **Crameri G,** Wang LF, Lipkin WI, Luby SP, Daszak P. Ebola virus antibodies in fruit bats, bangladesh. **Emerg Infect Dis**. 2013 Feb;19(2):270-3

Papenfuss AT, Baker ML, Feng ZP, Tachedjian M, **Crameri G**, Cowled C, Ng J, Janardhana V, Field HE, Wang LF. "The immune gene repertoire of an important viral reservoir, the Australian black flying fox" **BMC Genomics**. 2012 Jun 20;13(1):261.

Crameri G, Todd S, Grimley S, McEachern JA, Marsh GA, Smith C, Tachedjian M, De Jong C, Virtue ER, Yu M, Bulach D, Liu JP, Michalski WP, Middleton D, Field HE, Wang LF. Establishment, immortalisation and characterisation of pteropid bat cell lines. **PLoS One**. 2009 Dec 11;4(12):e8266.

Statement of Current and Pending Support

HUGHES CURRENT SUPPORT

- USAID – "PREDICT 2" - $21,000,000 – (10/01/14-09/30/19)
- USAID – "Infectious Disease Emergence & Economics of Altered Landscapes" - $1,999,203 – (10/15/13-10/14/16)

HUGHES PENDING SUPPORT

- N/A

Statement of Current and Pending Support

BRODER CURRENT SUPPORT

- BDRD/NMRC - "Infectious Disease Surveillance and Assay Development for the Enhanced Protection of the War Fighter and Global Health Security" – $357,903 - (10/01/2015-09/30/2017)
- BDRD/NMRC - "Identification, Countermeasures, and New Therapies Toward Biological Threat Agents"; Component Project: "Soluble Trimeric Filovirus Envelope Glycoproteins"- $78,085 (09/26/2013 – 03/31/2016)
- USUHS/PPG - "Therapies for Neurotropic Viral Biothreat Pathogens" - S390,056 - (10/01/2016 -09/30/2016)
- NIH/NIAID - "Henipavirus Entry and Virion Assembly" - $250,000 (07/13/2013-06/30/2017)
- USUHS - "Analysis of the entry and egress of Cedar virus a new species of Henipavirus" – $20,000 - (10/01/2012-09/30/2015)

BRODER PENDING SUPPORT

- DTRA – "Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses in Rural Communities in Uttar Pradesh, India" - S2,441,111.80 – (10/01/2016-09/30/2019)

Statement of Current and Pending Support:

PIKE CURRENT SUPPORT

- Department of State, Biosecurity Engagement Program (BEP): Febrile Surveillance in Malaysia $195,000 (10/01/2015 – 09/30/2016)

PIKE PENDING SUPPORT

- Global Emerging Infections Surveillance and Response System (GEIS): Burkholderia Surveillance Among US Marines in Australia – $165,000 (01/01/2016 – 09/30/2016)
- Defense Threat Reduction Agency MERS-CoV Surveillance in SE Asia $840,000 (04/01/2016 – 03/31/2019)

HDTRA1-14-24-FRCWMD-BAA
Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Dear Sir or Madame,

We are pleased to submit a revised Phase II proposal for HDTRA1-14-24-FRCWMD-BAA **Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.** We have gone through each of the reviewers' comments and responded to them in a separate document which we have included in attachment 3 in the supporting documents. Where appropriate, we have revised content within the full scientific proposal to respond to comments, and we have indicated where changes were made in our response in attachment 3.

The comments were helpful, and we hope that we have sufficiently clarified any questions that the reviewers had. Please do not hesitate to contact me should you require any further clarification.

Sincerely,

Dr. Jonathan Epstein

Principle Investigator
Associate Vice President,
EcoHealth Alliance.

HDTRA1-14-24-FRCWMD-BAA

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Response to reviewers' comments and indication where proposal has been revised in response.

Technical

1) *It is requested that the authors clarify the benefit of the proposed approach to threat detection*

There is growing evidence that zoonotic viruses such as Ebola and Nipah virus, which are select agents and classed as potential bioweapons, are widely circulating in bat hosts throughout Asia and Africa, where infectious disease surveillance capacity is generally poor. As evidenced by the Ebola outbreak in West Africa, virus spilled over from an animal reservoir into people in a remote village in Guinea, resulting in viral spread across borders into three countries before the virus was detected and international agencies could intervene. This project will establish surveillance for select agents in a country that has already experienced an outbreak of Nipah virus which lead to the deaths of more than 100 people in two countries. The outbreak was detected because it occurred on a large pig farm, but it is likely that other spillover events have occurred on smaller farms and gone undetected. Routine serological surveillance for henipaviruses or filoviruses is not currently conducted on farms or in human populations with high levels of contact with bat reservoirs, which means zoonotic transmission may be missed and the possibility for viral amplification and spread within human or animal populations still exists. Further, Ebola surveillance has not yet been established in Malaysia, despite evidence from the Philippines that Reston Ebola virus is present in bat species which also occur in Malaysia. The ability to determine whether people or livestock have been exposed to henipaviruses or filoviruses will help the government of Malaysia develop policy to reduce the risk of transmission events and also provides a means to diagnose exposure from deliberate release of these or related select agents. In addition, little is known about the genetic spectrum of henipaviruses and ebolaviruses in bats, and the Luminex system augments the molecular surveillance tools currently in place via the PREDICT project. Thus, this serological surveillance system benefits risk reduction by enhancing Malaysia's capacity to detect exposure to select agents in livestock and human populations that may have been deliberately released and identify high risk locations and behaviors related to exposure via contact with wildlife reservoirs.

Note: we have made revisions to emphasize/clarify threat reduction in: the Abstract and throughout the proposal, including section III. Relevance.

2) *Although proposed to use samples from an ongoing study of acute febrile illness and patients with a history of animal contact, including cases without the suspected exposure may enable the authors to better quantify risk as well as identify novel risk factors.*

The reviewers are correct, and we have expanded the scope of Orang Asli samples collected under the UM/ NMRC-A study. In addition to the Orang Asli hospital-based study of acute febrile cases at Gombok, funding was just granted to Co-PI Pike and UM Prof. AbuBakar to also conduct community-based serosurveillance of healthy individuals in up to 15 Orang Asli communities that reflect a spectrum of animal exposure from urban communities unlikely to have animal exposure to

more rural communities that may have more contact. This, coupled with our proposed study in forest communities should provide a broad spectrum of exposures and give us the potential to identify novel routes of exposure. A questionnaire will be developed for the new UM study that collects information about a range of behaviors, including consuming dropped fruit, palm sap, and bushmeat. We expect that our analysis from the proposed studies within this proposal will provide valuable insight into the types of behaviors that may be associated with henipavirus and filovirus exposure and allow us to develop more targeted epidemiological studies in the future.

3) *Foodborne transmission of henipavirus has been reported, suggesting that infection may not require direct animal contact. With the current approach, the authors may fail to identify some risk factors.*

The reviewer is correct that in Bangladesh and the Philippines, henipavirus transmission has been food borne (date palm sap and consumption of infected horse, respectively). In Malaysia, there were no documented cases of food borne transmission during the 1998 outbreak. In fact, all cases of NiV encephalitis has exposure to sick pigs. In the Philippines, consumption of infected horse meat led to human infections. It is, of course possible that in Malaysia there are additional behaviors that constitute risk. Date palm sap is not consumed the same way in Malaysia as in Bangladesh. However, we will include questions in our community and hospital based Orang Asli studies about palm sap, sick animal consumption, bushmeat consumption, dropped fruit consumption, and contact with sick livestock to address the possibility food borne and other routes on infection.

Programmatic:

1) *It is requested that the authors provide more information on the relationship between USAID's PREDICT project and the proposal. The critique of the white paper requested that these relationships be explained in greater detail, yet the full proposal has not adequately done so. A diagram(s) of the relationship within the context of the collection and processing of the sera would be helpful.*

   We have further clarified this relationship within the body of the proposal in section II, page 7. In addition, as requested, we have provided the reviewers with a figure showing sampling activities and workflow, as well as specific sample numbers and which partners are collecting and testing them (see below). In simplest terms, this DTRA project will exclusively use serology to investigate henipavirus and filovirus antibodies in biological samples. Because the core team that is responsible for implementing PREDICT activities in Malaysia is EHA and Conservation Medicine Ltd. and we work with the same govt. of Malaysia entities: the Department of Wildlife and National Parks, the Ministry of Health (National Public Health Lab) and the Department of Veterinary services and its vet school, UPM, we are able to screen human and animal serum samples previously collected by PREDICT that will not otherwise be tested.

   The farm study and an expanded Orang Asli study are proposed here, and are unique to this proposal. They will now be fully supported through this project budget (see budget justification). PREDICT will support the additional concurrent collection of swab samples from bats, livestock and people sampled under this study, and the testing of those samples for henipavirus and filovirus *RNA* using PCR. We will co-analyze the molecular and serological data, providing the Government of Malaysia (and USG

stakeholders) with a more robust picture of filoviruses and henipaviruses present in bats, livestock and people.

2) *It is requested that the authors provide a detailed description of each organization's role. It is not clear from the proposal, or the budget, which group will conduct the serological survey sampling.*

We have clarified these details in the proposal under specific tasks and section II Programmatics Partner Institutions and roles. CM will work with MoH personnel to sample Orang Asli and farm workers; with the Department of Wildlife and National Parks to sample wildlife in Orang Asli villages and around farms; with UPM, and State DVS officers to sample livestock on farms. The University of Malaya (UM) will conduct the Orang Asli serological sampling at specific at Gombok Hospital and communities in Selangor under an ongoing and separately funded study with NMRC-A. Our proposed project will support the collection of an additional blood sample by UM, who will also test those samples using Luminex. USU and EHA will provide reagents and Luminex training to each partner lab (NPHL, UPM, DWNP, and UM).

3) *It is requested that the authors provide a work flow diagram and/or a chart, on sample collection strategies (i.e. study sites, sample size, species, agency conducting sampling).*

We have provided these here due to space limitations:

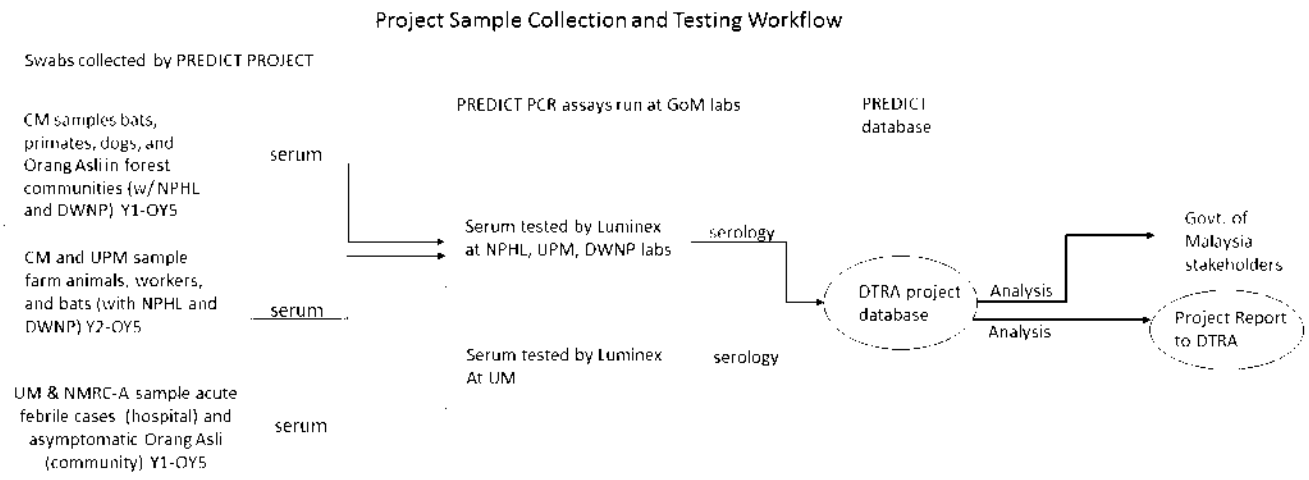

Table 1. Samples collected and tested by task, partner, and diagnostic lab.

Task	Samples Y1-Y2	Samples Y3-OY5	Total Samples Y1-OY5	Samples collected by:	Tested by
3	950 macaque		950 macaque	PREDICT (Archived)	DWNP
3	175 bat		175 bat	PREDICT (Archived)	DWNP
3	300 Orang Asli		300 Orang Asli	PREDICT (Archived)	NPHL
3	200 Orang Asli		200 Orang Asli	UM / NMRC-A (Archived)	UM
4	300 Orang Asli	300 Orang Asli	600 Orang Asli	CM, MoH	NPHL
4	450 bats, 30 NHP	450 bats, 30 NHP	900 bat, 60 NHP	CM, DWNP	DWNP
4	90 dogs	90 dogs	180 dogs	CM	UPM
4	up to 1000 OA	up to 1500 OA	up to 2500 Orang Asli	NMRC-A/UM active project	UM
5	800 bats, 120 NHP	800 bats, 120 NHP	1600 bats, 240 NHP	CM, DWNP	DWNP
5	600 livestock	600 livestock	1200 livestock	UPM, DVS, CM	UPM
5	60 farm workers	60 farm workers	120 farm workers	MoH, CM	NPHL

4) *Recommend assessment of the risk associated with activities (i.e. Year 1-Task 4, Year 1-Task 5, and the technology transfer in Year 2-Task 1) that are described as being in pre-coordination or that may not occur, and provide risk mitigation strategies, such as alternative approaches, or remove activities if risk is assessed to be very high.*

We have resolved all pre-coordination issues with DVS and now have their full support for this proposal and commitment from UPM, the national vet college under DVS, to collaborate under this study (see letters from DVS and UPM). Therefore, we no longer consider any of the proposed activities to be high risk.

Administrative:

5) *It is requested that the authors clarify the number of graduate students that will be supported in the study, particularly from Malaysia. Four students are mentioned in the quad chart, but this number was not reflected in the proposal.*

We have clarified this in the Full Proposal Detailed Task List and Statement of Work. There will be up to 2 Malaysian graduate students from UM (either 2 masters level or 1 PhD student) and 1 PhD student from UPM. A fourth graduate student involved is from USU.

Budget:

Note that we have provided clarification based on the reviewers questions regarding budget in the Budget Justification, as well as in this document.

6) *It is requested that the authors have the number of animal sampling within the proposal (1,250 noted), match what is proposed in the budget.*

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Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

We have revised the budget and justification so that the sample numbers and budget accurately reflect the proposed study.

7) *It is requested that the authors clarify the large discrepancy in materials costs for serological sampling between Conservation Medicine and NMRC-TIDREC ($4,000 vs $40,000).*

The sampling cost rates for supplies and materials provided by CM (now only $31,000 per year for Orang Asli and Farm study human and animal sampling) reflect the fact that wildlife and animal capture materials and sampling and Orang Asli Community sampling are much more resource intensive, particularly in a forest environment, compared to the UM study which will largely be working with hospital-based patients or people from relatively accessible communities. This is factored into CM's cost per sample rate. Also, the sampling materials and logistics for the UM study will largely be paid for by their existing dept. of State award, with the exception of an extra 3cc tube and cyrovials which will be provided to collect an additional aliquot of blood and serum sample for our project, which makes the UM costs lower.

8) *It is requested that the authors clarify the cost for new generic protein, and that the cost is consistent within the text and chart.*

We have updated the details in the budget justification narrative (see Table 1) to clarify this cost calculation.

9) *It is requested that the authors provide clarity on why costs for Luminex materials vary greatly from year to year*

10) *It is requested that the authors remove plans to come to Virginia for the DTRA Annual Technical Review. This is not a requirement for this study.*

We have removed this activity from the plan and budget. We thank the reviewers for the clarification on this point.

Administrative:

11) *It is requested that the authors clarify the number of graduate students that will be supported in the study, particularly from Malaysia. Four students are mentioned in the quad chart, but this number was not reflected in the proposal.*

We have clarified this in the detailed task list within the full proposal.

12) *Additional materials and documents are required at this stage to allow initiation of the US Government Interagency reviews. These items include full legal names, additional*

names/spellings/aliases, birth dates, and curriculum vitae and/or resumes for all foreign project participants, including any personnel that have been identified since the proposal submission. The same information is also required for any additional partner nation participants.

We have provided these.

PROJECT START DATE Oct 1 2016

The reviewers of the Protocol Risk Assessment Tool (PRAT) requested the following comments be addressed:

Section 1f:
1) Please clarify why Facility 1 USU does not have an autoclave.

Facility 1 USU: Has a centralized autoclave facility on the same floor as all listed laboratory spaces.

2) *Will TIDREC be manipulating samples? If so this facility needs to be listed in this section with the appropriate laboratory information.* **This section has been updated.**

3) *NWFL (Facility 3) lists an "Animal sampling and treatment room" in this section. Is this an ABSL? If so please update this section* **This is not a biosafety level room**

4) *In the comments section please clarify which facility has the additional rooms.* **This has been updated**

5) *Section 1g: Recommend this section be revised to reflect 1)the roles of each facility, 2)what samples will be received at each facility and what will be done with these samples, 3)the field collection portion of the project was not addressed in the workflow section, 4) culturing was not addressed in the workflow but it is outlined later in the PRAT as an activity,*

6) *Discrepancy between mice being used as hosts, but not outlined in the workflow section, and what facility mice will be used in:* ***Mice will not be used in this study other than in reagent development by USU. This has been updated in the PRAT.***

Section 2a:
1) *Please include culturing in the workflow, since it is listed as an activity. Also, please indicate what facility will be culturing.* **We have updated to clarify that culturing will not be an activity.**
- *Identify what facilities will conduct culturing.* **Culturing will not take place in this study.**

2) *Identify what animals will be used. Please update workflow sections and other relevant sections*
We have updated the animal use table and description.

3) *Identify what facility will conduct the recombinant DNA work and what facility will be receiving it. Request this section be updated* **Facility 1 (USU) will do recombinant DNA work. Section is updated.**

4) *Please complete 2a OTCC section.* **This will not take place. Section has been updated.**

Section 2b:

1) *Please verify if Facility 2 (NPHL) will conduct pathology, parasitology, and toxicology activities* **NPHL will not conduct pathology, parasitology, or toxicology activities.**

2) *Please verify whether vaccine and vector research will be conducted* **Vaccine and vector research will not be conducted. Section has been updated.**

Section 2c:
1) *Please explain the use of the aerosol chambers and homogenizers for Facilities 2 & 3 in relation to the study* **Aerosol chambers and homogenizers will not be used. Section has been updated.**

2) *Section 2d: Please confirm that all BSCs utilized in this study will be recertified and remain certified for the duration of the project. Currently all BSCs listed need to be recertified this year.* **All BSCs will be recertified throughout the project.**

Section 2f:

1) *The PRAT does not mention non-human primates, as mentioned in the full proposal. Recommend updating with the PRAT or proposal.* **Macaques are included in this study but none will be housed in any of the facilities. Only free-ranging macaques will be sampled.**

2) *Please clarify how lab-raised mice are to be used as a host model*
This following has been include in the animal section on the PRAT form: Mice will be used for immunological reagent development by facility 1 (USU). They will be immunized with purified recombinant viral glycoproteins and subsequently processed for monoclonal antibody development. IACUC approval of USU protocol (MIC-13-262) was 09/30/2013 and expires 09/29/2016, but will be submitted for renewal 08/01/2016

Section 2g: Please clarify if there will be an IRB. If not, please explain why? **Yes, there will be an IRB for human work. The exact approval date is unknown.**

Section 3c: A 'Project Specific SOP' was listed for Facility 4 but not explained/defined in the comment section. Please clarify if there will be one? **Luminex SOPs, developed at the Australian Animal Health Laboratory will be utilized in this project – Section has been updated**

Section 4b:
Facility 1 (USU) is a United States facility but does not comply with US standards (BMBL 5th ed.) in relation to its laboratories (i.e. sealed laboratory surfaces, laboratory air is not recirculated). Please verify

the information, and provide an update section. **There were multiple errors on the form. This section has been updated. Facility 1 (USU) does comply.**

2) *Please confirm that Facilities 2 – 4 have BSL-3/BSL-2 enhanced laboratories* **Confirmed**

Section 5a: Facility 1 (USU) is a United States facility but does not comply with US standards (BMBL 5th ed.) in that is does not have safety goggles/glasses for its BSL-2. Please confirm the information provided is correct and update section if necessary **Safety goggles/glasses are in place. This section has been updated.**

Section 6b:
Please confirm that Facility 1 (USU) does not have internal laboratory doors that lock. **All laboratory doors lock and have a self-closing mechanism.**

2) *Please confirm whether the guard walks the grounds (exterior monitoring) and the building(s) (interior monitoring) and update the section as necessary.* **Facility 1 has a 24/7 guard force. Physical monitoring occurs both outside and within all areas of the facility, including all monitored laboratory spaces with incubators, refrigerators and freezers. Facilities 2-5 all have security.**

Section 6c: Please clarify how hard copy data is stored at Facility 1 (USU) and why such data it is not secured in a DoD facility. **Hard copy data is stored in locked laboratory and office spaces.**

Section 6e: Please verify for Facility 1 (USU) who their carrier/shippers are and update the section. **Federal Express is used for Facility 1.**

Section 6f: Please clarify and verify why there are no personnel management measures in place for a US DoD Facility (Facility 1 (USU)). Please update this section accordingly. **This section is now updated. There are fully compliant management measures in place.**

Section 7e: Please provide a scanned copy of the PIs actual signature

ATTACHMENT 3 SUPPORTING DOCUMENTATION

1) FOREIGN PRINCIPLE INVESTIGATORS AND OTHER MEMBERS OF FOREIGN RESEARCH TEAM

Complete details and complete CV's provided in the Research and Related Senior/Key Person Profile Form

Foreign PIs:

Mr. Tom Hughes
President
Conservation Medicine Ltd., D203, Block D, Paradesa Tropika, Persiaran Meranti, Bandar Sri (b)(6)

Gary Crameri, BSc
Senior Laboratory Scientist, Consultant, EcoHealth Alliance (based in Geelong, Australia, formerly CSIRO AAHL).

Brian L. Pike, PhD, MPH
Research Scientist
U.S. Naval Medical Research Center (b)(6)
(b)(6)

Other members (alphabetical order):

Professor Sazaly Abu Bakar
Professor, Tropical Infectious Diseases Research & Education Centre (b)(6)
Faculty of Medicine, University of Malaya (b)(6)

Dr. Liyen Chang
Technical Expert, Tropical Infectious Diseases Research & Education Centre (b)(6)
& O, Faculty of Medicine, University of Malaya, (b)(6)

Ms. Yukie Chen
Scientific Officer, National Public Health Laboratory, (b)(6)
(b)(6)

Mr. Jimmy Lee
Research Scientist, Conservation Medicine, Ltd., (b)(6)
(b)(6)

Ms. Mei Ho Lee
Microbiologist, Senior Research Officer, Conservation Medicine, Ltd. (b)(6)
(b)(6)

Dr. Daniel Schar
Senior Regional Emerging Infectious Diseases Advisor
U.S. Agency for International Development
Regional Development Mission for Asia, Bangkok, Thailand.

Mr. Frankie Thomas Sitam MSc
Wildlife Research Officer, Department of Wildlife and National Parks (DWNP) KM10 Jalan Cheras, 56100 Kuala Lumpur, Malaysia

Dr. Khebir bin Verhasib
Director, National Public Health Laboratory, Ministry of Health, Lot 1853, Kampung Melayu Sungai Buloh, 47000 Sungai Buloh, Malaysia

Professor Linfa Wang
Director, Programme in Emerging Infectious Disease, Duke-NUS Medical School, 8 College Road, Singapore 169857

Dr. Latiffah binti Hassan
Head of Department, Veterinary Laboratory Diagnostics, Faculty of Veterinary Medicine, Universiti Putra Malaysia, Serdang 43400 Selangor DE, Malaysia

Dr. Noorliza Binti Mohamad Noordin
Head, Disease Division, National Public Health Laboratory, Ministry of Health Malaysia, Lot 1853, Kampung Melayu Sungai Buloh 47000 Sunagi Buloh, Selangor Darul Ehsan

2) DESCRIPTION OF RELATIONSHIP BETWEEN PROJECT AND CURRENT RESEARCH EFFORTS OF FOREIGN RESEARCH TEAM

EcoHealth Alliance has worked with the Government of Malaysia on zoonotic disease research since 2001, (and Epstein since 2003) beginning with a large international collaboration studying the emergence of Nipah virus. PI, Epstein (EHA) and Co-PI Hughes have worked together on zoonotic disease surveillance projects since 2005, beginning with a large-scale NIH-funded study of Nipah virus in bats, which was done in close partnership with the Veterinary Research Institute (VRI) and the Department of Wildlife and National Parks (DWNP). Since 2007, the scope of collaborative research undertaken by EHA in Malaysia has expanded to include the study of human populations highly exposed to wildlife (e.g. Orang Asli) and then in 2009, EHA began implementing activities under the USAID EPT PREDICT program. This One Health initiative has been an active partnership between EHA, CM, the DWNP, NPHL, and VRI, with technical input from USAID RDMA (Schar) in Bangkok. The objectives of PREDICT, now in its 7th year in Malaysia, are fully consistent with the objectives of this research proposal. Indeed, PREDICT established capacity in all three GoM lab partners to screen human and animal samples for RNA from novel viruses using broad, viral family-level assays and a synthetic universal positive control. Additionally, EHA, CM, and DWNP have developed a wildlife disease surveillance program under which more than a dozen wildlife officers have trained in safe capture and sample collection from key wildlife reservoirs including bats, rodents, and nonhuman primates. This proposed research project will expand the capabilities of the

Government of Malaysia and PREDICT to include broad serological surveillance for henipa- and filoviruses, and the Luminex-based platform will be applied to human and wildlife samples already collected by DWNP, NPHL, EHA and CM and to be collected by the PREDICT project which will run in parallel with the activities proposed under this study. The results from this project will inform PREDICT as it seeks to identify a serological platform to integrate into its surveillance protocols.

EcoHealth Alliance (PI, Epstein), CM (Hughes), the Broder Lab at USU (Broder), Gary Crameri and Professor Linfa Wang (both formerly from CSIRO Australian Animal Health Laboratory) have worked together for more than 10 years on research related to zoonotic disease ecology in bats, livestock and people in Australia and throughout Asia. In 2003, Dr. Epstein worked with Professor Wang and Mr. Crameri on collaborative research in China that identified bats as the natural reservoir for SARS coronavirus. While at the CSIRO Australian Animal Health Laboratory in Geelong, Wang, Crameri, Epstein and Broder have used the Luminex-based assays for henipaviruses and filoviruses, described in this proposal, to screen bat and other animal samples. Currently, The Broder lab also has active and proposed collaborative activities with Drs. Linfa Wang and Dr. Ian H Mendenhall, Program in Emerging Infectious Diseases, Duke-NUS Graduate Medical School, Singapore. These ongoing collaborations have been spearheaded by postdoc Dr. Eric Laing, who will be engaged in the present proposal's efforts. These collaborations involve using the Broder lab virus glycoprotein coated beads together with Duke-NUS banks of sera from bats, other potential wildlife reservoirs, and livestock so that they can be screened in a cost-effective and high throughput fashion. Eric Laing, with the support of a NSF Fellowship, transferred our multiplex technology to Duke-NUS in 2015 in order to carry out some pilot serosurveillance studies. The collaborative research performed at the Duke-NUS Graduate Medical School will further demonstrate the efficacy of the multiplex assay to screen wildlife and livestock sera from study sites in Malaysia. Additionally, it can demonstrate whether multiplex bead assays should be applied in biosurveillance of zoonotic pathogens for other One Health projects. These related research areas are highly relevant and strongly supportive of the significantly expanded goals of the present proposal.

The U.S. Navy has conducted biomedical research in the Asia Pacific region since 1945. The U.S. Naval Medical Research Center-Asia (NMRC-A), a cooperative research initiative established in Singapore, is part of this proud Navy tradition. NMRC-A's mission is to identify infectious disease threats of military and public health importance and develop and evaluate interventions and products to mitigate those threats. NMRC-A supports U.S. interests in the Pacific Theater and advances diplomacy in the region by conducting infectious disease research and improving disease surveillance and outbreak response assistance for infectious diseases of critical public health importance to the United States and our regional partners. NMRC-A will serve as the lead DoD liaison, providing collaborative project management, on-site technical expertise, assist with quality control/assurance, and provide additional support to project collaborators as needed. The proposed project leverages NMRC-A's existing partnerships and resources in the region, specifically those linked to an established Biosecurity Engagement Program cohort funded by the U.S. Department of State. Further, the focus of this proposal is in direct support of USPACOM's Theater Security Cooperation agenda which promotes stability and security throughout the region by strengthening local capacity to detect and respond to

emergent biological threats and developing working relationships between host countries and their U.S. counterparts.

UPM Faculty of Veterinary Medicine and EcoHealth Alliance have had a working relationship since 2004 when they worked together on the NIH funded Nipah virus research in Malaysia. Dr Latiffah and Dr Epstein co – supervised a Malaysian PHD candidate enrolled at UPM Faculty of Veterinary Medicine under this grant. The Faculty of Veterinary Medicine and EcoHealth Alliance have maintained a working relationship over the last 12 years most recently through the USAID funded Emerging Pandemic Threat Program. EcoHealth Alliance coordinate PREDICT activities in Malaysia and the national coordinating office for MYHOUN (One Health Workforce) is located at the Faculty of Veterinary Medicine. The chairman and coordinator of MYHOUN are both staff at the Faculty of Veterinary Medicine.

UPM Faculty of Veterinary Medicine will assist with sample collection at farms on Peninsular Malaysia and the screening and analysis of all livestock samples will be conducted at the Virology lab at the Faculty of Veterinary Medicine. The Faculty will facilitate this process by providing a technician to assist with the screening, a Post Graduate student will be identified to pursue a PHD through this project at the Faculty.

3) FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance, New York, USA
EcoHealth Alliance (EHA) is an NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EHA scientists have been working on spatial modeling of zoonoses for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EHA is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory – freezer storage and light microscopy. The scientific staff (25 core scientists, 100+ field staff) is supported by a core admin staff of 11, which is available for work on this project and is funded through foundation and federal support. EHA does not support diagnostic facilities at its core headquarters, and works in partnership with a network of leading diagnostic labs in the USA and around the world.

EHA is equipped with 25 networked PCs including ARRA-funded International LifeSize Video Conferencing facilities. High-speed video conferencing facilities are installed with key international collaborators. EHA has access to a 24-7 server, server support, and all required software including Geographic Information Systems (ArcGIS, GRASS), statistical programs(R, MatLab, SPSS), word and spreadsheet processing (Microsoft Office and LibreOffice), graphic editors (Inkscape, Adobe CS3) running on both Apple and Windows Operating Systems. Additionally we have a twenty-processor hyper-threading, public IP addressed Linux server which can be used for intensive computational modeling. All our databases are maintained in either PostgreSQL or MongoDB and stored in our server. To ensure data redundancy and to streamline our workflow we make use of cloud storage services (Dropbox, Google Drive and Crash Plan).

EHA is the headquarters of a global network of over 70 partners that provides exceptional leverage for the core scientists. This network includes staff from: intergovernmental agencies

(WHO, OIE, FAO, DIVERSITAS, IUCN); locally based wildlife conservation organizations in Asia, Africa and Latin America; infectious disease surveillance laboratories including BSL-3 and -4 laboratories; and scientific institutions. EHA is the headquarters of the One Health Alliance of South Asia (OHASA); the Consortium for Conservation Medicine (CCM); the journal *EcoHealth*; the IUCN Wildlife Health Specialist Group; and the OIE Wildlife Health Network. EHA is a member of the IUCN and Columbia University's Center for Environmental Research and Conservation (CERC) and the Center for Infection and Immunity, so that all scientific staff hold adjunct appointments at Columbia University's E3B Department, or in the Department of Epidemiology at the Mailman School of Public Health.

Uniformed Services University (USU), Maryland, USA
USU is the medical school at which approximately half of the physicians in the Armed Services receive their graduate training. Research at USU is supported primarily by extramural grants, as in other medical schools. The PI is a tenured Professor in the Department of Microbiology and Immunology, which includes 12 full-time Faculty members. The overall focus of the Department is mechanisms of infectious diseases and the host response/immunology. A major focus of the PI's Department is virology and viral Immunology. Faculty interests and active research programs at USU are diverse, with many nationally- and internationally-known investigators, including the PI's chair, Dr. Alison O'Brien, who was the 2008-9 President of the American Society for Microbiology (ASM). USU is also physically located directly across from the main NIH campus in Bethesda, and within a short distance from Frederick, MD, and the PI maintains a very active collaboration with NCI, NIH, investigators which has been in place for over 25 years since the PIs postdoctoral work began at NIH in 1989. The PI has a 110 sqft office across from laboratories. Two full time secretaries and two program managers are available to provide support within the department. A Learning Resource Center is a medical and scientific library with additional microcomputers and support. A wide variety of scientific journals are available in print and via remote computer access. The Henry M. Jackson Foundation (HJF) with USU will manage this award. A central autoclave/glassware washroom serves the Department of Microbiology and Immunology and is maintained through extramural grant support.

There are seven computer work stations located in the PI's laboratories and a computer in the PI's office. The computers are connected to each other by a server, and hardwired to the USU network, with Google Unlimited storage, and WiFi is also available. A variety of software programs are available, including statistical analysis programs, Reference Manager, Power Point, MS Word, Quattro Pro, Excel, Clone Manager Suite v7.0, Align Plus v4.0, Prizm, Flowjo 10.2 (flow cytometry analysis software), Primer Express, ABI 7500 analysis software. In addition, Cluster and Statistical Analysis for Microarrays program is available from other laboratories. The PI's laboratories are divided into 3 rooms totaling 1,440 sf and each set up to maintain its own cell culture BSL2 operations. The laboratories are equipped with eight CO2 incubators for tissue culture, 4 inverted and 1 bright field microscopes, high speed and ultracentrifuges, four biological safety cabinets, 2 -20°C, 3 -80°C freezers, 4 liquid nitrogen freezers 6 refrigerator/freezers, 4 PCR machines, 2 ELISA plate reader, and various small equipment items (gel electrophoresis, circulating adjustable water baths, heat blocks, western blotting apparatuses, etc..). Two GE-ATKA low pressure chromatography systems, with integrated UV detectors, fraction collectors, and pump systems, and gradient fractionator.

The USU Biomedical Instrumentation Center (BIC) Flow Cytometry Core includes two Becton-Dickinson (10- and 13-parameter) LSRII FACS analyzers and one 15-parameter FACSAria FACS sorter, as well as off-line analysis workstations. The BIC Imaging Core houses two confocal microscopes, including a Zeiss LSM Pascal system with 405/458/488/514/543 laser excitation and Zess 710NLO system with 405/458/488/514/561/633 conventional lasers and a Coherent Ultra2 Ti-Sapphire laser for multiphoton excitation, continuously tunable over the range of 690 to 1080 nm. A Becker-Hickl two-detector FLIM system (for FRET analyses) is on order, and will be connected to the Zeiss 710NLO. The facility has several wide-field fluorescence microscopes, and three data analysis stations with software packages including: Zeiss Zen software and full Physiology package; Media Cybernetics' 3D Constructor, Image Pro Analyzer, Autodeblur, and Autovisualize; Metamorph Basic. An Imaging Core also has a Philips CM100 transmission EM and an ultramicrotome (Leica EM UC6 with EM FC6 cryo attachment). There is also an on-site oligonucleotide and peptide synthesis facility. Mass spectrometry (MALDI-TOF) instrumentation is available, as is an integrated FLA-5000/LAS-3000 imaging system (Fuji) for many applications that involve fluorescence and chemiluminescence imaging of gels and blots.

Conservation Medicine, Ltd. (CM), Malaysia
Conservation Medicine Ltd., was incorporated in 2014 in Kuala Lumpur, Malaysia, and is directed by Mr. Tom Hughes who has worked with EcoHealth Alliance since 2007. CM employs two other scientists, all who have worked together with EcoHealth Alliance since 2009 to implement field and lab projects including activities under the USAID Emerging Pandemic Threats: PREDICT program. CM is equipped with office space, laptop computers, internet, mobile phones, GPS units, and a 4WD vehicle fully equipped for field transportation to remote field sites. CM maintains wildlife capture equipment and supplies for biological sample collection and liquid nitrogen dry shippers for ensuring cold chain during transport of biological samples from field to lab. CM has supplies of personal protective equipment for all field and lab staff, including PAPRs and N95 respirators, gloves and disposable coveralls. CM maintains communication with NPHL, DWNP and VRI on behalf of EHA, and CM scientists work closely with government partners to implement PREDICT field and lab activities.

The Department of Wildlife and National Parks (DWNP), Malaysia
The Department of Wildlife and National Parks, or PERHILITAN, is the federal wildlife authority for Peninsular Malaysia. They are responsible for conservation of all wildlife species in the country, and have research staff that are trained in wildlife medicine, conservation, and laboratory sciences (e.g. genetics). Since 2002, the DWNP has been involved in wildlife disease research as a partner with EcoHealth Alliance, focusing on Nipah virus in bats. It has become increasingly more active in actively participating in wildlife disease and epidemiological studies and is a fully-engaged partner under the Emerging Pandemic Threats: PREDICT program with EcoHealth Alliance and Conservation Medicine, Ltd. As a result of a growing investment from the Government of Malaysia, the DWNP was allocated resourced in 2013 to construct a new forensics and disease diagnostic laboratory, which is scheduled to come online in 2016. This lab will be equipped with a pathology room, BSL-2 PCR suites, ultra-cold storage; and a serology suite, which will be where the Luminex-based assay described in this proposal will be placed. DWNP's engagement in this proposed project is indicative of their desire to understand which

zoonotic pathogens are present in wildlife reservoirs in Malaysia, and in playing a critical role in the GoM's One Health approach to disease surveillance and public health.

National Public Health Laboratory (NPHL), Malaysia

The National Public Health (NPHL) is a division under the Disease Control Division, Department of Public Health, Ministry of Health, which has been built to provide support services to the outbreak investigation and surveillance activities. There are five public health laboratories, the National Public Health Laboratory, Sungai Buloh, which is the national laboratories and four regional laboratories: the Public Health Laboratory Johor Bharu, Johor; Public Health Laboratory Ipoh, Perak; Public Health Laboratory Kota Kinabalu, Sabah and most recently built Public Health Laboratory Perol, Kelantan. Implementation of the new laboratory building project was started in July, 1997 and was built on an area of 27.6 acres with a building area of 6,865 square meters.

The vision of NPHL is to become a center of excellence in providing analytical and diagnostic services to support disease surveillance, outbreak investigations and food security in Malaysia. NPHL also funtions to provide laboratory services to assist in the investigation and control during an outbreak of diseases; provide laboratory services for surveillance and monitoring of all Public Health-related diseases; provide laboratory services for the food surveillance activities and enforcement of the food safety act; provide training and human resource development in the field of epidemiology, food quality control and disease control on health care as well as assist in research activities under the Public Health Program by providing laboratory diagnosis.

The laboratories in NPHL provide services commensurate with outbreaks investigation, disease surveillances and food safety. The list of laboratory investigation provided by NPHL include: Microbiology (bacteriology, mycobacterium, tuberculosis, Mycobacterium leprae, parasite, malaria, viruses, clinical chemistry, tar and nicotine, insectorium) and Food (food and water biology, pesticides residues, drug residues, additive and nutritional labeling, mycotoxin and natural toxin, GMO & food speciation, natural and environmental pollutants) testing. NPHL is activity involved in the outbreak investigation and provided various analytical tests that included: viral culture, PCR, serology, culture and sensitivity, antigen detection (only sputum), microscopic techniques and serotyping. NPHL is also able to analyze sources of the outbreak for the common pathogens or diseases such as (poliomyelitis syndrome, enteroviral meningitis (E71), other viral meningitis, Japanese encephalitis, influenza, respiratory syncycial virus, adenovirus, pertussis, diphtheria, streptococcal pharyngitis, scarlet fever, bacteria pneumonia, measles, rubella virus, chikungunya virus, herpes simplex virus, varicella zoster virus, hand, food and mouth disease, dengue, malaria, hepatitis A, hepatitis B, leptospirosis, entero pathogenic bacteria, viral gastroenteritis, adeno virus or enteroviral, bacteria conjunctivitis, Meliodosis, legionellosis and other diseases as well as food and environmental poisoning.

Tropical Infectious Diseases Research and Education Centre (TIDREC), University of Malaya, Kuala Lumpur, Malaysia

TIDREC is a research center dedicated to the advancement of knowledge in tropical infectious diseases in Malaysia, focusing especially on neglected tropical infectious diseases that have the potential impact on the global community.

TIDREC was set up in 2008 in the Department of Medical Microbiology in the Faculty of Medicine, University of Malaya. University of Malaya is the oldest university and the leading research university in Malaysia. Additionally, it is one of the largest teaching and referral hospital in the capital city of Kuala Lumpur. TIDREC houses the WHO Collaborating Centre for Arbovirus Reference and Research (Dengue and Dengue Haemorrhagic Fever). More recently, TIDREC has established linkages with the Orang Asli Affairs Department to conduct biosurveillance for emerging and re-emerging pathogens at selected aboriginal villages. TIDREC has also recently established collaboration with the Ministry of Health to determine and identify etiologies of febrile disease in patients presenting at the hospitals and health clinics in the semi-urban and rural areas in and around Kuala Lumpur.

TIDREC has 14 scientific staff members, including virologists, bacteriologists, parasitologists, immunologists and technicians. TIDREC leverages on existing experience and expertise of the scientific staff members who have a strong tradition in research on epidemiology, surveillance and diagnostics, with particular strengths in dengue virus, Nipah virus, respiratory viruses and rickettsiae. The members have active collaboration with many local and international partners, as well as various sources of project funding, local and international.

TIDREC owns necessary facilities to perform biosurveillance activities and pathogen screening through next generation sequencing, microarray and Luminex assay. TIDREC has a fully certified modular Biosafety Level 3 laboratory and also a mobile Biosafety Level 3 laboratory for fieldwork. Freezers and ultra-low temperature freezers for storage of human serum are in highly secured locations with controlled access and appropriate inventory system. TIDREC is currently applying MS ISO/IEC 17025:2005 accreditation for the Biosafety Level 2 diagnostic laboratory. TIDREC's scientific staff is well trained in biosafety and biosecurity. They are capable to work in high-containment facility and are fully competent to handle work involving infectious agents. TIDREC also has members who are GCP trained as well as certified phlebotomists.

Universiti Putra Malaysia (UPM), Selangor, Malaysia
Formal teaching is conducted mainly in the Academic Block, while clinical practice and core clinical training take place at Universit Veterinary Hospital (UVH), (that is equipped with seminar rooms, ward spaces, tables and chairs for revision, and WIFI access. Students on call are provided with overnight rooms furnished with beds), the Necropsy Block and the University Agricultural Park/*Taman Pertanian Universiti* (TPU). Core clinical teaching is in the form of formal lectures, practical classes, student-centred and problem-based learning, rounds, clinical conference, and handling of hospital cases. Clinical teaching in companion animal medicine and surgery, farm and exotic animal medicine and surgery, veterinary diagnostic imaging, and clinical skills is conducted in UVH. Industrial training is conducted in government and commercial animal farms and veterinary laboratories in the country and abroad, zoos, wildlife conservation centres, and animal shelters.

The teaching methods in the clinics are progressive and innovative, utilizing clinical facilities that meet the standards of the Malaysian Veterinary Council (MVC). The Faculty is the first educational institution in Malaysia accredited with MS ISO 9001:2008 for comprehensive quality management system for teaching, services and research. The diagnostic laboratories of

Veterinary Labs Services Unit (VLSU) including the Virology lab to be used for this project) are accredited with MS ISO/IEC 17025:2005. The University Agricultural Park obtained Malaysian Good Agricultural Practice certification (MyGAP) from the Department of Veterinary Services (DVS) Malaysia in 2014 and maintains a quality management system (QMS) under ISO 9001:2008 and Environmental Management System (EMS). Clinical teaching methods are current, with hands-on training and provide opportunities to obtain first-hand information from clients, conduct physical and clinical examinations, formulate problem lists, differentials and plans, and treatment of patients, all under the supervision of clinicians. The standard and effectiveness of clinical teaching are assessed by feedbacks on the performance of Faculty graduates employed by veterinary clinics, the DVS Malaysia, and other veterinary and related organisations.

Students have access to a broad range of diagnostic and therapeutic facilities, training in diagnostic imaging (X-rays, ultrasound, CT, fluoroscopy), anaesthesia (gas machines, ventilators, multiparameter monitors), intensive and critical care (blood pressure monitors, desk top blood and chemistry analysers), internal medicine (endoscopes, blood pressure monitors) surgery, use of controlled drugs and vaccines, case management, and ambulatory services in UVH. Post-mortem and diagnostic histopathology training are performed in the Necropsy Block. Exposure to laboratory diagnoses is by rotation to the VLSU, the commercial diagnostic arm of the Faculty. The Faculty also has access to the Livestock Division, University Agriculture Park (TPU), and foster farms for student training. The University Veterinary Hospital has separate isolation facilities for cats and dogs that are fully ventilated and well-maintained with standard operation procedures (SOPs) to prevent disease spread. Isolation of large animals is handled at the farms and under the supervision of the DVS Malaysia.

The majority of lectures and supervised laboratory practical classes for pre- and para-clinical courses are conducted in the Academic Block. Clinical grand rounds for small animals, large animals, radiology, and post-mortem are held in the auditorium. Faculty students are rotated to VLSU for laboratory diagnosis training. Students have access to the computer laboratory, library, anatomy museum, student centre and a student-managed business laboratory (PutraBiz). The Necropsy Block facilitates the demonstration and training in necropsy procedures, sample collection, tissue preparation for histopathology, and carcass storage.

At UVH companion animal practice and clinical classes are conducted in the fully air-conditioned units with separate entrances, reception and waiting areas, examination rooms, medicine and surgical wards, and quarantine wards for cats and dogs. Routine blood tests are done in VLSU while a mini-laboratory in UVH is used for immediate analyses. The Diagnostic Imaging, Pharmacy, Veterinary Anaesthesia and Critical Care Units are available for student training. Students on their own time can practice clinical skills in the Clinical Skills Laboratory using the Objective Structured Clinical Examination (OSCE) technique. Farm animal practice and clinical classes are conducted in UVH and TPU.

The Faculty follows a set of SOPs, including online reporting of incidents according to the Occupational Safety and Health Policy 2013. The University Emergency Action Team responds to any emergency in the Faculty. The Faculty under the supervision of the University Fire Department runs regular fire drills. Fires escape routes are clearly posted with assigned assembly

points. Fire extinguishers are checked and maintained once a year. Students are instructed on biosafety and on hygienic practices at the beginning of each semester. Emergency showers and eye wash stations are in place at several strategic locations in the Veterinary Complex. Most diagnostic laboratories and UVH facilities are accessible to authorised personnel only. The University Health Centre is less than 3 km and a Government General Hospital (Serdang Hospital) is approximately 500 m from the Veterinary Complex.

The clinical pathology and diagnostic pathology laboratories are under the purview of the Department of Veterinary Laboratory Diagnostics and include haematology and clinical biochemistry, bacteriology, virology, serology, parasitology, animal resource unit, histopathology and post-mortem. These laboratories are well-equipped diagnoses for domestic animals and other non-traditional species such as aquatic animals, marine mammals, and zoo/exotic animal species in accurate and timely manner.

A company assigned and contracted to dispose waste materials provides colour-coded bins and bags for placement of waste materials to be collected on a schedule. Animal carcasses are disposed by burying in a university-designated piece of land. Animal waste from the large animal wards flows into a treatment tank before discharge.

4) FOREIGN PI AND KEY PERSONNEL LETTERS OF COLLABORATION

DEPARTMENT OF THE NAVY
NAVAL MEDICAL RESEARCH UNIT TWO
PSC 470 BOX 4200
FPO AP 96534-4200

6500
00F0/0254
10 Dec 15

From: Commanding Officer, Naval Medical Research Center - Asia
To: Defense Threat Reduction Agency, Counter Weapons of Mass Destruction Thrust Area 6 Program

Subj: LETTER OF SUPPORT FOR THE PROPOSAL ENTITLED "SEROLOGICAL BIOSURVEILLANCE FOR SPILLOVER OF HENIPAVIRUSES AND FILOVIRUSES AT AGRICULTURAL AND HUNTING HUMAN-ANIMAL INTERFACES IN PENINSULAR MALAYSIA"

1. This letter confirms that the Naval Medical Research Center – Asia (NMRC-A) is aware of, and a willing collaborator in, the proposed project entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia" on which Dr. Jonathan Epstein serves as the Principal Investigator.

2. The proposed work is very much in line with our current infectious disease research priorities. Additionally, through increased capacity and enhanced surveillance, the proposed project will further the aims of USPACOM's Theater Security Cooperation initiative which seeks to promote stability and security throughout Southeast Asia.

3. We are eager to partner with the collaborators of this project. Questions pertaining to this proposal and our involvement should be directed to our command's lead on this project, LT Brian Pike, at brian.pike@fe.navy.mil or by phone at +65-6751-2228.

M. R. MONTEVILLE

HENRY M. JACKSON FOUNDATION
FOR THE ADVANCEMENT OF MILITARY MEDICINE

Advancing Military Medical Research

Research Initiatives Office
(240) 694-4016

December 24, 2015

Emma Lane
Program Assistant
EcoHealth Alliance
460 West 34th Street – 17th Floor
New York, New York 10001

Re: Letter of Intent to Collaborate

Dear Ms. Lane:

This letter affirms The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc.'s intent to collaborate in the project entitled "Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia", under the direction of Dr. Jonathan Epstein, to be submitted to the Defense Threat Reduction Agency (DTRA), in response to Funding Opportunity Number: HDTRA1-14-24-FRCWMD-BAA.

Dr. Christopher Broder, Professor, Department of Microbiology, Uniformed Services University of the Health Sciences (USUHS), is the Principal Investigator for The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc. (HJF).

The proposed budget period is April 1, 2016 through March 31, 2021. The total budget for HJF is $1,203,179 which includes $421,934 in Facilities and Administrative costs.

Our organization is subject to and compliant with the requirements of OMB Circulars A-122 and A-133. Our organization is also compliant with the updated PHS Financial Conflict of Interest (FCOI) regulation and has enrolled in the FDP Clearinghouse of Institutions compliant with these regulations. The appropriate programmatic and administrative personnel of HJF involved in this grant application are aware of the consortium agreement policy and are prepared to establish the necessary inter-organizational agreement(s) consistent with that policy.

Sincerely,

Lisa Straker,
Senior Proposal Manager-Team Lead

cc: Dr. Christopher Broder, Principal Investigator

UNIVERSITY OF MALAYA

14 December 2015

To: DTRA C-WMD Thrust Area 6 Program,

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to me or my organization, as described in the project narrative of this proposal, specifically (i) serological analysis of collected blood samples for henipavirus and filovirus infections using appropriate assays including the Luminex binding assay; and (ii) participating in training opportunities at partner organizations to acquire relevant expertise and skills to accomplish the assigned tasks. I commit to ensure completion of the assigned tasks within the available means and resources at my disposal, and to share the findings from the project with the community at scientific meetings and through joint-scientific publications; however I or my organization is not obligated to give away any samples obtained from this project and shall not hold any liability arises from this collaboration.

I recognize the proposed project would provide valuable opportunities in advancing knowledge to better understand pathogens of concern in this country and region, particularly henipaviruses and filoviruses. The project would also provide support for training in technical epidemiological and laboratory skills, allowing us to increase long-term professional capacity within the country.

We look forward to a successful and productive partnership with the collaborators of this project.

Sincerely yours,

Professor Dr. Sazaly AbuBakar
Director
Tropical Infectious Diseases Research and Education Centre (TIDREC)
University of Malaya

TROPICAL INFECTIOUS DISEASES RESEARCH & EDUCATION CENTRE (TIDREC)
University of Malaya Centre of Excellence (UMCoE)
Deputy Vice-Chancellor (Research & Innovation)
Level 4, Block N & O, Faculty of Medicine
University of Malaya
50603 Kuala Lumpur, MALAYSIA
T: +603 7967 6670 F: +603 7967 5753
W: http://www.tidrec.um.edu.my E: tidrec@um.edu.my

TIDREC@UM®
"Research that touches lives"

MAKMAL KESIHATAN AWAM KEBANGSAAN
KEMENTERIAN KESIHATAN MALAYSIA
NATIONAL PUBLIC HEALTH LABORATORY
MALAYSIA MINISTRY OF HEALTH
LOT 1853, KAMPUNG MELAYU SUNGAI BULOH
47000 SUNGAI BULOH
SELANGOR DARUL EHSAN

Tel : 03-6126 1200
Faks : 03-6140 2249 / 6157 1036
Portal Rasmi : http://mkak.moh.gov.my

Ruj. Kami : MKAK 100 – 9/1 ( )
Tarikh : 28 DISEMBER 2015

To: DTRA C-WMD Thrust Area 6 Program

From: Dr. Khebir bin Verasahib

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the mutually agreed tasks assigned to me or my organization for successful implementation of this proposed project.

We hope that the proposed project would provide support for valuable opportunities to formally train our staff in laboratory skills, allowing us to increase long-term professional capacity within the country. In doing so, we will able to support better understanding of the risk of Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.

We are eager to partner with the collaborators of this project.

Sincerely,

Name : Dr Khebir bin Verasahib
Title : Director
Institution : National Public Health Laboratory (NPHL)

Rujukan kami : JPHL&TN(IP): 90-7/8 Jld 13 ( )
Tarikh : DISEMBER 2015

To: DTRA C-WMD Thrust Area 6 Program

From: Mr. Fakhrul Hatta bin Musa

By signing below, I acknowledge that I (on behalf of my institution) listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to my organization, as described in the project narrative of this proposal, which are subjected to be discussed in future meetings and mutually agreed by all collaborating parties prior to the commence of the said project.

We hope that from this project we will be able to enhance our capacity and expertise in wildlife zoonotic disease surveillance, as well as better understands the risk of spillover of *Henipaviruses* and *Filoviruses* in Peninsular Malaysia which will greatly benefit the country. We are looking forward for valuable opportunities to formally train our staff in technical laboratory skills and transfer of latest technologies into our laboratory facilities.

We are eager to partner with the collaborators of this project.

Sincerely,

Name : Fakhrul Hatta Bin Musa
Title : Director of *Ex-situ* Conservation Division
Institution : Department of Wildlife and National Parks (DWNP) Peninsular Malaysia

To: DTRA C-WMD Thrust Area 6 Program

From: Daniel Schar, V.M.D.

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the project narrative of this proposal, and I commit to provide or make available the resources specified therein.

I take the opportunity to highlight this proposal's complementarity with—and contributions to—the Global Health Security Agenda, and the United States' commitments to partner internationally to mitigate emerging infectious disease threats. Additionally, the work envisioned adds a critically important dimension to USAID's Emerging Pandemic Threats, PREDICT 2 work in Malaysia and across Asia, enabling enhanced serological surveillance that will further refine the understanding of risk profiles associated with these viral families.

I acknowledge my full endorsement of this proposal, and am pleased to partner with the collaborators of this project.

Sincerely,

Daniel Schar, V.M.D.
Senior Regional Emerging Infectious Diseases Advisor
U.S. Agency for International Development
Regional Development Mission for Asia
Bangkok, Thailand

DUKE
GRADUATE MEDICAL SCHOOL

8 College Road Singapore 169857
T 6516 7666 F 6221 7396
www.duke-nus.edu.sg
A school of the National University of Singapore (RCB No: 200604346E)

28-12-2015

To: DTRA C-WMD Thrust Area 6 Program

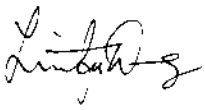
From: Linfa WANG

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to me or my organization, as described in the project narrative of this proposal, and I commit to provide or make available the resources specified therein.

The proposed project would provide opportunities to test some of our recently developed platforms in molecular and serological detection of bat-borne viruses. Participation in this project will also enhance our existing collaborations as well as opening up new collaboration network in the region, which will be crucial for our long-term aim to improve our preparedness in response to potential outbreaks of zoonotic agents.

We are eager to partner with the collaborators of this project.

Sincerely,



Linfa (Lin-Fa) WANG, PhD FTSE
Professor & Director
Programme in Emerging Infectious Diseases
Duke-NUS Medical School

www.csiro.au

CSIRO Australian Animal Health Laboratory
5 Portarlington Road, Geelong VIC 3220
PO Bag 24, Geelong VIC 3220, Australia
T (03) 5227 5000 • **ABN** 41 687 119 230
F (03) 5227 5555

To: DTRA C-WMD Thrust Area 6 Program

From: Gary Crameri

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the project narrative of this proposal, and I commit to provide or make available the resources specified therein.

The proposed project would provide a valuable opportunity for us to formally train local students in technical epidemiological and laboratory skills, allowing us to increase long-term professional capacity within the country. In doing so, we will generate knowledge to promote better understanding of the pathogens of concern for this country and region. This will also extend the surveillance capacity in one of the key regions for emerging infectious disease.

I am eager to partner with the collaborators on this important project.

Sincerely,

Gary Crameri
Research Scientist
CSIRO Australian Animal Health Laboratory

Conservation Medicine Ltd
(b)(6)

To: DTRA C-WMD Thrust Area 6 Program

From: Tom Hughes

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. I agree to undertake the tasks assigned to me or my organization, as described in the project narrative of this proposal.

The proposed project would provide support for valuable opportunities to build capacity within government partner labs in Malaysia and to conduct vitally important serological surveillance for henipaviruses and filoviruses at high risk interfaces. This program is complementary to the activities we are conducting with EHA and the Government of Malaysia under the Emerging Pandemic Threats: PREDICT program. The knowledge gained from this work will provide important information about Ebola virus in bat reservoirs, and help inform future One Health strategies for zoonotic disease research and surveillance in Malaysia.

We are eager to partner with the collaborators of this project.

Sincerely,

Tom Hughes
Director
Conservation Medicine, Ltd.

UNIVERSITI PUTRA MALAYSIA

FAKULTI PERUBATAN VETERINAR
FACULTY OF VETERINARY MEDICINE

17th May 2016

To: DTRA C-WMD Thrust Area 6 Program

From: Dr. Latiffah Hassan

By signing below, I acknowledge that I am listed as a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia," with Dr. Jonathan Epstein as the Principal Investigator. Faculty of Veterinary Medicine subject to the terms to be mutually agreed upon by the parties, agrees to cooperate in the proposed project.

The proposed project would provide support for valuable opportunities to augment serological diagnostic capabilities at the Faculty of Veterinary Medicine in UPM and training for students interested in livestock health and disease surveillance at livestock facilities. The proposed activities are consistent with our priorities for zoonotic disease surveillance involving livestock and livestock health.

We welcome the opportunity to partner with EcoHealth Alliance on this project.

Sincerely,

ASSOC. PROF. DR. LATIFFAH HASSAN
Head of Department
Veterinary Laboratory Diagnostics
Faculty of Veterinary Medicine
Universiti Putra Malaysia
43400 UPM Serdang, Selangor.

DEPARTMENT OF VETERINARY SERVICES
MINISTRY OF AGRICULTURE AND AGRO-BASED INDUSTRY
BLOCK PODIUM, LOT 4G1,
WISMA TANI, PRECINT 4
FEDERAL GOVERNMENT ADMINISTRATION CENTRE
62630 PUTRAJAYA ,
MALAYSIA

Telephone : 03-8870 2000
Fax : 03-8888 6051
E-mail : pro@dvs.gov.my

Ref No : JPV/BKP/D/100-1/1/2 ( )

Date 16 May 2016

To: DTRA C – WMD Thrust Area 6 Program

From: Dato' Dr. Kamarudin bin Md. Isa

I acknowledge that The Department of Veterinary Services a collaborator on this proposal, entitled "Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia, " with Dr. Jonathan Epstein as the Principal Investigator. DVS subject to the terms to be mutually agreed upon by the parties, agrees to co-operate in the proposed project.

We hope that the proposed project would provide support for valuable opportunities to augment serological diagnostic capabilities at the national veterinary college (UPM) and training for DVS staff involved in livestock health and disease surveillance at livestock facilities. The proposed activities are consistent with our zoonotic disease surveillance.

We welcome the opportunity to collaborate with EcoHealth Alliance on this project.

Sincerely,

Name : Dato' Dr. Kamarudin bin Md. Isa

Title : Director General

Institution : Department of Veterinary Services

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 9

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA11710037	14 Apr 2017	J3CTB23032

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2320	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DFAS COLUMBUS CENTER DFAS-CO/SOUTH ENTITLEMENT OPERATIONS P.O. BOX 182317 COLUMBUS OH 43218-2264	HQ0338

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	See Schedule

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				
				15G. TOTAL AMOUNT OF CONTRACT	**$2,408,373.45**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM	1		I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 3			**PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.**	
	C	DESCRIPTION/ SPECS./ WORK STATEMENT		X	J	LIST OF ATTACHMENTS	9
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	4		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	5				
X	G	CONTRACT ADMINISTRATION DATA	6 - 8		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] SEALED-BID AWARD (Contractor is not required to sign this document.)
Your bid on Solicitation Number _____
including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the terms listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTS OFFICER GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	13-Apr-2017

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot		$2,408,373.45

FRBAA14-6-2-0050_R: Base Year
COST
Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.

In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B.
FOB: Destination
PURCHASE REQUEST NUMBER: J3CTB23032

ESTIMATED COST $2,408,373.45

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Incremental Funding
COST
Incremental funding in the amount of $565,205.00.

ESTIMATED COST $0.00

ACRN AA $565,205.00
CIN: J3CTB23032000101

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000102					$0.00

Incremental Funding
COST
Incremental funding in the amount of $201,612.00.

ESTIMATED COST $0.00

ACRN AB $201,612.00
CIN: J3CTB23032000102

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		1	Lot		$767,080.93
OPTION	FRBAA14-6-2-0050_R: Option Year 1 COST Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia. In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B. FOB: Destination				
				ESTIMATED COST	$767,080.93

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		1	Lot		$735,963.67
OPTION	FRBAA14-6-2-0050_R: Option Year 2 COST Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia. In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B. FOB: Destination				
				ESTIMATED COST	$735,963.67

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	N/A	N/A	N/A	Government
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A
0002	N/A	N/A	N/A	Government
0003	N/A	N/A	N/A	Government

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
0001	POP 01-MAY-2017 TO 30-APR-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A
0002	POP 01-MAY-2020 TO 30-APR-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
0003	POP 01-MAY-2021 TO 30-APR-2022	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20152017 D 34HQ 0901515BR_KD_BP_OT 1517_0134_34HQ_PRICT DTRA 410
AMOUNT: $565,205.00

AB: 044315 097 0134 000 N 20162018 D 34HQ 0901515BR_KD_BP_OT 1618_0134_34HQ_PRICT DTRA 410
AMOUNT: $201,612.00

ACRN	CLIN/SLIN	CIN	AMOUNT
AA	000101	J3CTB23032000101	$565,205.00
AB	000102	J3CTB23032000102	$201,612.00

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4COC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. Grantee Business Office:
Name: Aleksei Chmura
Title: Authorized OrganizationalRepresentative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. Jonathan H Epstein
Title: Associate Vice President, Conservation
Phone: (212) 380-4467
E-mail: epstein@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/J3CTB
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)

email address (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

FUNDING PROFILE:

The amount of $766,817.00 is obligated for work to be performed during the period beginning with grant award and continuing through April 30th, 2018. Additional incremental funding planned, but not obligated, is:

FY18 $121,958.02
FY19 $804,315.14
FY20 $715,283.29

The Government's liability is limited to the amount obligated

INVOICE SCHEDULE:

INVOICE NO.	INVOICE DATE	PAYMENT
1	August 01, 2017	$222,193.76
2	December 01, 2017	$222,193.76
3	April 01, 2018	$222,193.75
4	August 01, 2018	$222,193.75

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	8	01-MAY-2016
Exhibit B	DTRA Terms and Conditions	17	31-OCT-2016

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein
CBEP-Thrust Area 6, CC WMD

Statement of Work

Project Title: Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Document Date: May 2016

Objective: The objective of this project is to enhance capacity within the Malaysia government to characterize the distribution of and detect spillover of novel and known henipaviruses and filoviruses, (both groups include high consequence zoonotic pathogens) in indigenous populations and farms in Peninsular Malaysia. Current surveillance strategies for novel zoonotic viruses rely exclusively on molecular detection tools, but Nipah and Ebola viruses are present at low prevalence in bat species which makes infected individuals difficult to detect. By establishing a multiplexed serological assay developed to detect antibodies against any henipa- and filoviruses, the Government of Malaysia (GoM) will more effectively be able to determine the distribution of these high-impact viruses in wildlife reservoirs and detect evidence of spillover in at-risk human or livestock populations. This enhancement of human and animal surveillance in all three sectors (wildlife, livestock and human health) and training of Malaysian scientists utilizes a One Health approach and will help reduce risk of zoonotic disease emergence and spread by accelerating detection and response. These activities fulfill DTRA CBEP's mandate and are also complementary to and supportive of the aims of the USAID EPT program and the Global Health Security Agenda.

Scope: This research includes transferring state-of-the art serological reagents and Luminex-based microsphere beaded technology that will allow the Government of Malaysia to use a One Health approach to conduct serological surveillance for all known *and unknown* henipaviruses and filoviruses in wildlife, domestic animals, and humans. The study will test archived human and wildlife serum samples which are linked to PCR-tested oral, rectal, or urogenital swab samples (collected and tested under the ongoing USAID Emerging Pandemic Threats: PREDICT program and a University of Malaya study of Orang Asli healthy populations and acutely febrile hospital cases). It will also conduct a new study looking at henipa- and filovirus antibodies in livestock and farm workers and wildlife near the farms, as well as an expanded Orang Asli study focused on hunting communities living in the forest. The grantee will investigate spillover of these pathogens by screening wildlife reservoirs (e.g. bats and nonhuman primates), people, and livestock for IgG antibodies to henipaviruses and filoviruses, while also continuing to develop and transfer additional tests that will detect antibodies against novel viruses in these groups.

Our team will focus on the following major goals and milestones:

1. Improve the Government of Malaysia's capacity to conduct serological surveillance for henipaviruses and filoviruses in human and animal populations, using a One Health approach.
    - Transfer Luminex-based technology into government and university diagnostic labs in three key sectors (wildlife, livestock, and human health); conduct trainings for staff to be able to screen samples, interpret results, and perform confirmatory assays; train local graduate students; and publish and share findings among GoM partners.
2. Determine the host distribution and seroprevalence of henipaviruses and filoviruses in wildlife (e.g. bat) populations in Peninsular Malaysia associated with Orang Asli communities and livestock farms.

- Conduct cross-sectional serological studies of humans and animals for henipa- and filoviruses by testing sera from new samples collected under this project and archived samples from PREDICT. Wildlife sampling will be conducted jointly with the Dept. of Wildlife and National Parks (DWNP); livestock sampling with DVS and UPM; and human sampling with MoH. These activities provide opportunity for One Health-based disease surveillance; threat reduction; and capacity building within the Government of Malaysia.

3. Conduct surveillance for IgG antibodies against filoviruses and henipaviruses in people and domestic animals which may indicate spillover from wildlife reservoirs. Sampling activities will focus on Orang Asli communities and farms in Peninsular Malaysia and will be conducted jointly with the Ministry of Health's National Public Health Laboratory (NPHL), DWNP, and the University Putra Malaysia under the Department of Veterinary Services (DVS). Serological surveillance will allow the GoM to focus limited resources and develop interventions to reduce threat from viral outbreaks in at-risk animal and human populations.

- Qualitative studies (e.g. questionnaires) detailing human-animal contact where sampling occurs will characterize high-risk behaviors and interfaces;
- Sampling human, wildlife, and domestic animal populations in Orang Asli forest communities that practice hunting.
- Sampling domestic animals and farm workers on large and small-scale farms and associated wildlife to identify evidence of spillover.

Our research will be focused on building capacity within the Government of Malaysia to conduct serological surveillance in human and animal populations in Peninsular Malaysia where people and animals are believed to have high levels of contact. Collaborators from the Government of Malaysia (GoM)'s Department of Wildlife and National Parks (DWNP), the Ministry of Health's National Public Health Laboratory (NPHL), the Department of Veterinary Service's University Putra Malaysia (UPM), University of Malaysia (UM), The Uniformed Services University, Maryland (USU), Conservation Medicine, Ltd. (CM), The US Navy Medical Research Center, Asia (NMRC-A), and Duke-NUS Graduate Medical School, Singapore (Linfa Wang lab) will play active roles in this research. EHA's history of successful collaboration with DWNP, MoH, and DVS under prior research projects and most recently through PREDICT, as well as having a Memorandum of Agreement with the aforementioned institutions, gives us confidence that we will be able to achieve the aims of this proposal (also see letters of collaboration).

The duration of the proposed project is three years, with optional 4th and 5th years containing follow-up Orang Asli studies and farm studies so that we have longitudinal data. These option years will significantly strengthen the overall study by enhancing our ability to detect temporal patterns of infection in bat and other animal populations as well as additional opportunity to detect spillover in humans or livestock. **Through these proposed activities we would create enhanced One Health surveillance for known *and novel* henipaviruses and filoviruses in human and animal populations in Peninsular Malaysia, an emerging disease hotspot**. The proposed activities would significantly support Malaysia's surveillance priorities, DTRA CBEP Thrust Area 6 objectives, the Global Health Security Agenda (GHSA), and the USAID Emerging Pandemic Threats program by allowing the Government of Malaysia to more rapidly detect infections of high impact zoonotic agents and develop effective interventions to prevent viral

outbreaks and reduce human and animal mortality, thereby reducing the threat from these high consequence viral agents.

Background:

Nipah virus (NiV), Ebola virus (EBOV) and Marburg Virus (MARV) are emerging zoonotic viruses belonging to the genera *Henipavirus* (Family *Paramyxoviridae*), *Ebolavirus* and *Marburgvirus* (both Family *Filoviridae*) and they have each caused outbreaks in people with high mortality rate. These viruses are listed as a select agents by HHS and USDA as pathogens of significant threat to both human and animal health. Nipah virus (NiV) is a zoonotic paramyxovirus (genus *Henipavirus*) with pandemic potential that first emerged on a pig farm in Malaysia in 1997 and led to a human outbreak with more than 260 cases and 40% mortality. Old world frugivorous bats, particularly Genus *Pteropus* (Family *Pteropodidae*), are natural reservoirs for a range of henipaviruses, including Nipah virus. Filoviruses circulate both in Africa and Southeast Asia, and have also been linked to bat reservoirs. In Africa, EBOV and Sudan virus (SUDV) have caused multiple human outbreaks with mean mortality rates between 50% and 90%. The current EBOV outbreak in West Africa, by far the largest Ebola epidemic in history, has had more than 28,600 cases, primarily in Sierra Leone, Guinea, and Liberia, with a mortality rate of 40%. The outbreak in West Africa has prompted the Government of Malaysia to determine whether filoviruses are circulating in bat species resident in Peninsular Malaysia. Malaysia's experience with Nipah virus, existing technical expertise, and its current commitment to using a One Health approach to disease surveillance (e.g. surveillance for novel zoonoses under PREDICT in all three sectors: wildlife, livestock, and human health) make it an ideal place to establish an advanced serological platform for detection of henipavirus and filovirus antibodies in wildlife and at-risk livestock and human populations.

Preliminary data: Serological studies of Nipah virus and Ebola virus using the Luminex-based platform. Studies conducted by our group have shown that NiV viral prevalence in pteropid bats is low (~1%-3%) and there is temporal variation to shedding. Mean seroprevalence in *P. vampyrus,* which is found across Peninsular Malaysia was 32% (n=253; range 16.7% - 42.4%). In Bangladesh, we conducted a 6-year longitudinal study of *Pteropus giganteus* using the Luminex-based platform to screen bats for IgG antibodies against both Nipah virus and Ebola virus Zaire. Between 20% and 80% of adult *Pteropus giganteus* were NiV seropositive, while between 20% and 50% were EBOV seropositive (Epstein et al, *in prep*). Nipah virus infections appear to peak in June/July while EBOV appears to peak in December (see also Project Narrative). We found a diversity of genetic strains of Nipah virus in *P. giganteus* (Epstein et al., *in prep*), and viruses which are NiV-like but distinct henipaviruses. Non-neutralizing antibodies against NiV-like viruses found in goats, cattle, and pigs in Bangladesh suggests that spillover from bats to domestic animals occurs and that there is a broad spectrum of henipaviruses circulating in bats. RESTV RNA was recently identified by our group in *Mineopterus schreibersii,* a common insectivorous bat. We also detected RESTV antibodies in two fruit bat species: *Cynopterus brachyotis* and *Pteropus vampyrus:* the latter is a NiV reservoir. In Bangladesh, we found antibodies against EBOV and RESTV in 3.5% of *Rousettus leschenaultii* (n=141). *M. schreibersii*, *R. leschenaultii*, and two *Pteropus* species, including *P. vampyrus* all occur in Malaysia, yet there is no data available regarding filoviruses in wildlife in Malaysia. The possibility that multiple henipaviruses or filoviruses capable of infecting people or livestock

to be circulating in bats in Malaysia makes enhanced surveillance and early detection of these high consequence viruses critically important for reducing their threat to public health.

PREDICT
Between 2009 and 2015, EHA, CM, and the Department of Wildlife and National Parks (DWNP) have collected and archived samples, including serum, from more than 1,400, animals including bats, rodents, and macaques all from areas where people and wildlife come into contact. While oropharyngeal, urogenital, and rectal swab samples have been or will be screened using PCR assays for viral families (including paramyxoviruses and filoviruses), corresponding sera remain archived (and untested) and will be made available for this project to test them using the Luminex-based assay.

University Malaya study of acutely ill Orang Asli patients.
We will also have access to archived and newly collected Orang Asli samples collected from acutely febrile patients at Gombak Hospital that serves the Orang Asli communities, under a separate ongoing disease study at the University of Malaya (Prof. Abu Bakar) and NMRC-A (Co-PI Pike). This study just received renewed funding to continue sampling febrile patients and expand to sample asymptomatic Orang Asli from communities across a land-use gradient, which will include individuals without animal exposure. Under this proposal we will screen sera collected from well characterized Orang Asli patients and community members using the Luminex-based platform.

Key references (Further references are available in the Project Narrative):

Luby, S.P., The pandemic potential of Nipah virus. *Antiviral Research*, 2013. 100(1): p. 38-43.

Olival, K.J. and D.T.S. Hayman, Filoviruses in Bats: Current Knowledge and Future Directions. *Viruses*-Basel, 2014. 6(4): p. 1759-1788.

Sarah I. Jayme, et al., Molecular evidence of Ebola Reston virus infection in Philippine bats. *Virology Journal*, 2015. 12(107): p. 1-8.

Sohayati A. Rahman, et al. Risk Factors for Nipah Virus Infection among Pteropid Bats, Peninsular Malaysia. *Emer. Infect. Dis.,* 2013. DOI: 10.3201/eid1901.120221.

***Tasks/Scientific Goals:* (Format: Year #(s). Task #. Sub-task#)**

Task 1: (Year 1-OY5). Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. The GoM has been engaged in using a One-Health approach to zoonotic disease surveillance since the NiV outbreak in 1998 and most recently via collaborations with EHA under PREDICT. However, current GoM and PREDICT surveillance activities in humans, wildlife and domestic animals are based on broad molecular assays designed to identify novel viruses (including henipaviruses and filoviruses). One of the challenges with this approach is that Nipah, Ebola, and related viruses tend to be acute and asymptomatic infections in bats, making detection of viral RNA challenging. IgG antibodies,

however, persist in bats (as well as people and livestock), reducing the sampling effort necessary to identify exposed or infected individuals in a population and also allowing for detection of asymptomatic carriers. Adding a serological component to existing surveillance will greatly enhance the government's ability to detect both known and unknown henipa- and filoviruses in wildlife, domestic animals and human populations at risk for spillover. To establish this capacity, we will provide a BioRad Bio-Plex 200 machine with computer console to NPHL and DWNP. We will provide all reagents for henipa- and filovirus assays. Following Bio-Plex installation, we will conduct a 10-day training course for lab technicians at DWNP and another at NPHL. UM has a Luminex machine and will receive assay reagents and lab staff will participate in one of the training workshops. 1 PhD student at USU will develop additional assay reagents in Y1-OY5. We will identify *either* 1 PhD or 2 Masters' students at UM and 1 PhD student at UPM to train under this project. We will provide additional training to technical staff from GoM partner labs in viral pseudo-type assay development at USU. The grantee shall:

1.1.1. Transfer BioRad Bio-Plex 200 to NPHL and DWNP labs;

1.1.2-2.1.2. Transfer Luminex-based filovirus and henipavirus reagents to DWNP, NPHL, and UM labs; the grantee will provide a BioRad Bio-Plex 200 to UPM and conduct a 10-day training workshop in Y2.

1.1.3.-2.1.3 Train lab staff to use Luminex-based assays

1.1.4- OY5.1.4 Supervise 1 UM PhD or 2 Masters' students (Y1-3), and 1 UPM PhD student

1.1.5-OY5.1.5 Convene the Science Advisory Group (annually in KL);

1.1.6-2.1.6 Develop a database for serology results and sample metadata; establish sample repository at partner labs.

Task 2. (Y1-OY5) Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. At USU, we will engineer soluble and secreted versions of henipa- and filovirus glycoproteins, expressed in mammalian cell culture systems to accurately reflect proper synthesis including their assembly and processing into properly glycosylated higher order complexes. Constructs will be designed and tested in pilot experiments for expression and analysis, and then used to establish stably expressing cell lines. Preparative amounts of the various soluble viral glycoproteins will be made using serum-free culture conditions in suspension culture, and proteins are purified using the appropriate tag protocol (either S-tag or double strep tag (TST)) by affinity chromatography, followed by concentration and size exclusion chromatography. We will test the utility of each individual glycoprotein by Luminex, ELISA and Western blotting then provide all necessary reagents to partner labs to accomplish the testing under this project. The grantee shall:

1.2.1-2.2.1 produce Mojaing virus (MojV) and African GH-M74a G glycoproteins; Bundibugyo virus (BDBV), Tai Forest virus (TAFV), Lloviu virus (LLOV), MARV Ravn, SUDV, SUDV GpΔmucin, RESTV (monkey), and RESTV (porcine) Gp glycoproteins.

1.2.2-3.2.2 use the completed viral glycoprotein preparations and produce polyclonal rabbit serum to each individual glycoprotein; test the utility of each individual glycoprotein by Luminex-based, ELISA and Western blotting assays;

1.2.3 Provide N protein reagents to detect novel henipa- and filoviruses to partner labs.

1.2.4-OY5.2.4: If novel henipa- or filoviruses are detected using molecular assays (under

PREDICT), grantee may develop new reagents for antibodies against these viruses and negative sera will be re-screened.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform (Y1-Y2). Grantee shall test up to 945 macaque and 175 bat archived serum samples collected under PREDICT and stored at DWNP, and up to 300 archived Orang Asli samples stored at NPHL, and up to 200 Orang Asli samples at UM. The number of samples will depend on available serum volume and quality. Results will be used to inform the Orang Asli and farm studies described in **Tasks 4 and 5**. Positive sera may be sent for confirmatory testing at USU using pseudovirus serum neutralization assays, ELISA, or Western blot. Results shall be entered into a database and shared with GoM partners.

1.3.1 Identify suitable archived animal and human sera;
1.3.2 Screen sera for henipa- and filovirus IgG antibodies at GoM and UM partner labs;
1.3.3 Confirm positive results using western blot or pseudovirus assay;
1.3.4 Enter results into database and analyze;
1.3.5-2.3.5 share results with partners.

Task 4. Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. (Y1-OY5). Indigenous communities living in forested areas and that practice subsistence wildlife hunting are at higher risk of exposure to zoonotic viruses due to handling and butchering wildlife and therefore contact with bodily fluids. In **Y1** of this project, we will apply for IRB ethical approval to continue and expand from a pilot study currently underway (expected completion: Oct 2016). Pending IRB and IACUC approval, CM, MoH, and DWNP will work together in **Y1-Y2** to sample 100 individuals from each of 3 Orang Asli communities in Perak State (incl. Kuala Lipis and Gua Musang), **totaling 600 human blood samples over five years**. 100 people sampled per community will allow us to detect a seropositive individual with 95% confidence at a prevalence of 3%, assuming a population of 500 individuals. We will also aim to sample blood from 50 bats per each of 3 species around each study village (e.g. *Miniopterus*, *Pteropus*, and *Rousettus* spp); 30 nonhuman primates; and 30 dogs, if present, in order to be able to detect henipa- or filovirus antibodies in an individual with 95% confidence given a 5% seroprevalence (in bats) and 10% in dogs and nonhuman primates. MOH officers and CM will collect blood from Orang Asli and associated animals, and serum will be separated either in the field or at partner labs and stored at -86C at prior to testing. A sample size of 50 bats would allow us to detect differences between study locations (or time points, should we conduct follow-up studies) of 56% with 95% confidence and 80% precision. The grantee shall conduct repeated sampling of Orang Asli and peri-domestic livestock and wildlife in the same communities in Y3-OY4. If novel henipa or filoviruses identified by PREDICT, new assays will be developed in OY4 and negative samples re-tested. Molecular and serological data from Orang Asli will be co-analyzed in OY4-OY5. In addition, we will test sera collected through an ongoing UM study of Orang Asli. Up to 500 samples per year will be collected Y1-OY5, and these will be tested using the Luminex-based platform at UM. Positive samples will be confirmed at UM or USU.
The grantee shall:

1.4.1.-OY5.4.1 Test Orang Asli, wildlife, and peri-domestic animal samples collected under PREDICT and UM studies
1.4.2-2.4.2, Y3.4.2, OY4.4.2-OY5.4.2. Enter results into database and analyze data;
1.4.3 – 2.4.3, Y3.4.3, OY4.4.3 Confirm sero-positive samples;

1.4.4. Develop follow-up study with GoM partners to be implemented in Y3.
2.4.5 Apply for IRB and permits for follow-up study
3.4.6 Implement repeated sampling in Orang Asli villages
3.4.7 Analyze longitudinal data
OY4.4.1. If new viruses found by PREDICT, develop new sero assay and re-test samples
OY4.4.2.-OY5.4.2 Confirm additional test results and co-analyze molecular and sero data

Task 5. Develop serological study of farm workers, livestock, and wildlife around farms. (Y1-OY5) Grantee shall conduct a serological survey of farm workers and animals living on or around 2 large-scale farms (>5000 ruminants and/or pigs) and 2 small-scale farms (500-1000 ruminants and/or pigs) in Peninsular Malaysia to detect exposure to henipa- or filoviruses. Grantee shall work with DWNP to sample bats, macaques and dogs proximal to farms; and with MoH to conduct qualitative research and collect blood samples from farm workers to screen for henipa- and filovirus antibodies. Grantee will work with UPM to sample and test livestock. In Y1 grantee will select appropriately sized farms. Grantee shall also locate bat caves or roosts proximal to each farm, meet farm owners, and characterize the livestock. Grantee shall apply for all necessary IRB and IACUC approvals. Grantee may commence sampling in Y2, pending approvals, and conduct a follow-up study in OY4 and OY5 (if funded). The grantee shall:

1.5.1 Meet with GoM partners to develop study;
1.5.2 Apply for ethical approvals and permits.
1.5.3. Conduct scoping visits to farms, characterize livestock and local wildlife species.
2.5.1-3.5.1 Collect wildlife, livestock, and human samples
2.5.2-3.5.2 Conduct questionnaires with farm workers
2.5.3-3.5.3 Screen samples using Luminex-based assay; confirm results
2.5.4-3.5.4 Enter data into database and analyze results
OY4.5.1-5.5.1 Repeat human, wildlife and livestock sampling at each farm
OY4.5.2-OY5.5.2 Test samples, enter results into database; analyze complete dataset
OY5.5.3 prepare manuscript based on (Y1-OY5) study

Task 6. Disseminate reports to relevant stakeholders (Y1-OY5). Grantee shall synthesize all data collected through the projects described above as well as capacity building activities in Malaysia. Scientific and general reports will be generated and provided to GoM partners and an annual report to DTRA. PhD or Masters' students will complete thesis and present at annual stakeholders meeting in KL or at scientific meeting in Malaysia. Grantee shall meet with GoM partners and SAG in Kuala Lumpur annually, according to schedule. Grantee shall present findings at scientific meetings (e.g. ASTM, ASM Biodefense, IMED, EcoHealth) to present findings according to the schedule.

1.6.1-OY5.6.1 submit progress reports to DTRA.
1.6.2-OY5.6.2 Complete annual report to local stakeholders.
1.6.3-OY5.6.3 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.6.4-OY5.6.4 Conduct annual stakeholder meetings.
3.6.5. Prepare comprehensive project report for GoM
3.6.7, OY5.6.7 UM Graduate students present thesis to committee and prepare publication in peer reviewed journal
3.6.6-OY5.6.6 Prepare and submit publications to disseminate study findings.

Project Timeline

Task	Y1	Y2	Y3	OY4	OY5
1. Enhance capacity in Malaysia for serological surveillance for all henipaviruses and filoviruses					
1.1. Transfer BioRad Bio-Plex 200 in NPHL, DWNP, and UPM labs					
1.2 Transfer serological reagents to NPHL, DWNP, UPM, and UM labs					
1.3 Training staff at partner labs					
1.4 Identify graduate students at UM and UPM					
1.5 Convene Science Advisory Group					
1.6 Develop database for serology results and sample metadata					
1.7 Training in pseudovirus development at USU					
2. Develop & validate henipavirus and filovirus reagents.					
2.1 Produce specific henipavirus and filovirus proteins					
2.2 Produce and test monoclonal antibodies against new proteins					
2.3 Transfer henipa and filo N protein assays to partner labs					
2.4. develop/validate proteins and mAbs for novel henipa- & filoviruses					
3.Screen archived wildlife and Orang Asli sera					
3.1 Identify archived wildlife and human sera at NPHL and DWNP					
3.2 Screen sera using Luminex-based platform					
3.3 Confirm positive sera with additional testing					
3.4 Enter results in database / analyze					
4. Sero-survey of Orang Asli and animals					
4.1 apply for IRB/IACUC approval					
4.2 Collect & test serum samples from Orang Asli ~ animals					
4.3 Enter results into database					
4.4 Confirm positive sera with additional testing					
4.5 Conduct follow-up study of Orang Asli and animals					
4.6 Analyze data					
5. Serological study of farm workers, livestock, and wildlife on farms	■	■	■	■	■
5.1 Apply for necessary permits and ethical approval	■	■			
5.2 scoping visits to potential study farms; select farms	■				
5.3 sample farm workers, livestock, and wildlife on farms		■	■		
5.4 follow-up study of farm workers, wildlife and livestock (4 farms)				■	■
5.5 Enter results into database / analyse results		■	■	■	■
6. Disseminate reports to relevant stakeholders					
6.1 annual report toDTRA					
6.2 annual report to government of Malaysia partners					
6.3 attend DTRA annual technical review					
6.4 partner meeting in Malaysia					
6.5 present results at scientific conference (e.g. ASTMH, IMED, ASM)					
6.6 prepare manuscripts for publication in peer-reviewed journal					

DEFENSE THREAT REDUCTION AGENCY (DTRA)
GENERAL TERMS AND CONDITIONS FOR GRANT AWARDS

Table of Contents

1. **Terms and Conditions Incorporated by Reference.**

   The DoD Research and Development General Terms and Conditions, dated July 2016, are hereby incorporated by reference and are available for download at website http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions.aspx.

2. **Acceptance of Grant.**

   The recipient is not required to countersign the Grant document; however, the recipient agrees to the conditions specified in the Research Grant and the Articles contained herein unless notice of disagreement is furnished to the Grants Officer within fifteen (15) calendar days after the date of the Grants Officer's signature. In case of disagreement, the recipient shall not assess the Grant any costs of the research unless and until such disagreement(s) is resolved.

3. **Recipient Responsibilities.**

   The recipient will bear primary responsibility for the conduct of the research and will exercise judgment towards attaining the stated research objectives within the limits of the Grant's Terms and Conditions.

   The Principal Investigator(s) (PI) specified in the Grant award will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The PI, operating within the policies of the recipient, is in the best position to determine the means by which the research may be conducted most effectively.

4. **Standards for Financial Management Systems.**

   Where the Federal Government guarantees or insures the repayment of money borrowed by the recipient, DTRA, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the recipient are not deemed adequate to protect the interest of the Federal Government.

   DTRA may require adequate fidelity bond coverage where the recipient lacks sufficient coverage to protect the Federal Government's interest.

   Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties, as prescribed in 31 CFR Part 223, "Surety Companies Doing Business with the United States."

5. **Modification of the Grant.**

   The only method by which this Grant may be modified is by a formal, written modification signed by the Grants Officer. No other communications, whether oral or in writing, are valid.

   Prior Approvals are required as follows:

   1) Expenditures on equipment costing $5,000 or more not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)
   2) Expenditures for foreign travel not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)

3) Prior approval is not required to transfer amounts budgeted for indirect costs to absorb increases in direct costs, or vice versa.
4) Prior approval is not required to carry forward an unobligated balance to a subsequent period of performance under this award.

6. Payments.

The 2 CFR 200 governs responsibilities concerning payments, with the following clarifications:

Recipients shall submit requests for payment using Invoicing, Receipt, Acceptance, and Property Transfer (iRAPT) at https://wawf.eb.mil/. Any request for advance payments must be approved by the Administrative Grants Office shown in Block 6 of the award. The request shall be submitted to the Administrative Office identified in Block 6 of the Research Grant by entering the following routing codes:

1) *Pay Office DoDAAC*: See Block 12 (Code) on the first page of the Grant.
2) *Invoice Type*: Grant and Cooperative Agreement Voucher.
3) *Issue By DoDAAC*: See Block 5 (Code) on the first page of the Grant.
4) *Admin DoDAAC*: See Block 6 (Code) on the first page of the Grant.
5) *Grant Approver*: Same as Admin DoDAAC (Leave Ext. blank).

Payments will be made by the Defense Finance and Accounting Service (DFAS) office specified in the Research Grant (Block 12).

A foreign awardee must have a U.S. bank account and be signed up for electronic payments (electronic funds transfers (EFT)).

7. Funding Increments and/or Options.

The recipient is advised that the Grantor's obligation to provide funding for increments and/or options included in the Grant is contingent upon satisfactory performance in the judgment of the DTRA Scientific Officer/Technical Monitor and the availability of funds. Other factors will be considered before options will be exercised (for example, expenditure rate and current programmatic objectives). Accordingly, no legal liability on the part of the Grantor exists unless or until funds are made available to the Grantor and notice of such availability is confirmed in writing to the recipient. Refer to the Funding Profile in Section G of the Grant for additional incremental funding planned, but not currently obligated for the Grant.

Funding Increments – In no event is the Government obligated to reimburse the recipient for expenditures in excess of the total funds allotted by the Government to this agreement. Recipients should note that low expenditure rates reported on payment requests may be cause for deferral of future increments. The Government anticipates unilateral modifications for funding increments.

Options – If the agreement contains Option(s), the Government reserves the right to exercise the Option(s) unilaterally.

8. Patent Rights.

Patent Rights are governed by 37 CFR 401.14 with the following clarifications: All DTRA-related disclosures, confirmatory licenses to the government, patent applications, and other communications should be submitted as detailed herein.

The 37 CFR Part 401 invention reporting requirements are summarized in the table below. Unless otherwise indicated in the "Submission to DTRA" column, the grantee is required to upload the following types of invention information using iEdison (https://s-edison.info.nih.gov/iEdison/), a single web interface for government grantees to report details of inventions and patents. If the grantee organization is not already an iEdison registrant, then iEdison registration is required prior to submission of the below invention reports. The grant shall not be closed out until all invention reporting requirements are met.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Invention Report: The grantee must submit a report of any "subject" invention. The report must identify inventor(s), federal agency(ies), grant number(s), and date of any public disclosure. Date of submission establishes time frames for all future actions. Must be complete in technical detail. The report should be directed to the lead agency.	Within 2 months of inventor's initial report to the grantee' contractor organization.	There is no single format for disclosing the invention to the government. The communication should include the title of the invention, date of any public disclosure, names of all inventors, source(s) of federal funding (i.e. grant number), a written description of the invention in technical detail. The invention disclosure should be signed by the inventor(s); at the very least signed by a grantee institutional official.	401.14(a)(2) 401.14(c)(1)	Submit electronically by uploading either a PDF, TIFF, or text file through iEdison.
Rights to Inventions on Subcontracts: Subcontractors retain rights to their subject inventions.	Same reporting responsibilities, obligations and time frames as prime grantee organization.	Prime grantee organization cannot require ownership of subcontractor's subject invention(s)	401.14(g)(1) 401.14(g)(2)	Invention disclosure, confirmatory license, and proof of gov't support clause shall be submitted electronically through iEdison.
Election of Title to Invention: Grantee organization must notify the federal agency sponsor that it will retain ownership of invention and take steps to commercialize the invention.	Within 2 years of reporting the invention to the lead federal agency sponsor. (If disclosed publicly, this period is decreased.)		401.14(b) 401.14(f)(1) 401.14(c)(2)	Submit electronically through iEdison.
Confirmatory license The grantee organization must provide a nonexclusive, nontransferable, irrevocable, paid-up license for the government to practice or have the invention practiced on its behalf throughout the world.	Commensurate with report of any initial patent filing, unless the invention is being licensed as an unpatented biological material or research tool.		401.14(f)(1)	Submit electronically by uploading either a PDF or TIFF file through iEdison.
Nonelection of Title to Invention: Grantee organization must notify the federal sponsor that it will not retain ownership of an invention.	Within 2 years of reporting to federal agency sponsor. (If disclosed publicly, this period is decreased.)	Effectively a waiver to the government. After further review the federal agency sponsor may elect title on behalf of the government. Title does not actually vest with the government until government elects to retain title.	401.14(c)(2) 401.14(d)	Submit electronically through iEdison.
Assignment of Invention Rights to the Inventor: The inventor may request assignment of invention rights. Agencies support requests of this type variously. In all cases, documentation is required when a grantee organization waives rights to the invention and the inventor(s) wishes to retain the invention rights.	At the time the grantee organization elects not to pursue title and the inventor requests rights in the invention.	First, the grantee organization must elect not to retain rights in the invention. Second, the inventor must request the assignment of rights, agree to all terms associated with invention reporting as detailed in 37 CFR 401, and must pursue commercialization of the invention through patent filing or licensing as a research tool. Specific procedures for any agency should be determined prior to initiating the request.	401.14(k)(1); non-profits	This status shall be indicated using iEdison. Submission of all other issues (such as outstanding required documents) should be resolved prior to proceeding further. Submission of the required documents will be done electronically by uploading either a PDF, TIFF, or text file through iEdison.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Initial Patent Application: The grantee must inform the government of the initial patent application that related to any subject invention. The patent application must include a government support clause.	Within 1 year after election of title, unless there is an extension.	Time frame may vary if invention becomes public. The term initial patent application means a nonprovisional U.S. national application for patent as defined in 37 CFR 1.9(a)(3). The notification must include the patent application number and filing date assigned by the USPTO. A copy of the full application is not required.	401.14(c)(3) 401.2(n)	All filing data shall be submitted via iEdison. Evidence of inclusion of government support clause shall be submitted electronically as either a PDF or TIFF file through iEdison.
Assignment to Third Party: Documentation necessary when a grantee contractor wishes to assign invention rights to third party. If the grantee-contractor is a non-profit, the government must approve the assignment. For profit or small business grantee contractors do not need to seek approval. If the rights are assigned, new rights holder assumes the same reporting responsibilities as the grantee contractor organization.		If assignment approved, third party must pursue commercialization of the invention through patent filing or licensing of the invention as a research tool. Specific procedures to request third party assignment may vary between agencies. Consult DTRA prior to initiating request.	401.14(k) for non-profits. Note the distinction between small businesses and non-profit organizations.	Documentation shall be submitted electronically as either a PDF or TIFF file through iEdison.
Issued Patent: Grantee must provide federal agency sponsor with patent issue date, number, title of patent, and evidence of government support clause.	At the time of issue.	Patent must include government support clause.	401.5(f)(2) 401.14(f)(4)	All issued patent information shall be provided using iEdison. Evidence of inclusion of government support clause will be provided electronically as a PDF or TIFF file through iEdison
Request for Extension of Time: An extension of up to two years may be requested for election of title, or one year for filing a patent application.	Prior to any statutory bar.	Extension of 2 years for title election and one year for patent application are preapproved for funded inventions. Additional extensions need written approval from the federal agency sponsor.	401.14(c)(4)	Request electronically using iEdison.
Discontinuance of Patent Application, Payment of Maintenance Fees, or Defense in a Reexamination or Opposition proceeding on a Patent: Grantee must notify federal agency sponsor of changes in patent status.	At any time in the process, but prior to established deadlines	Relevant information and documents (e.g., patent application or patent) must be provided such that a determination to protect government interests can be made. The federal agency sponsor has the option to pursue the patent application or the patent if not being properly pursued or maintained. Any change in status must be reported at least 30 days prior to pending PTO office actions.	401.14(f)(3) 401.6	Indication shall be made via iEdison.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Annual Utilization Report: DTRA requires utilization reporting for all subject inventions that have had title elected or are licensed without a patent. Report includes stage of development, date of first commercial sale or use, number and type of licenses, gross income, licensing to small business, status of U.S. manufacturing and identification of any FDA-approved product names.	Annually	DTRA requires invention utilization reports on a 12 month reporting cycle beginning in the month of grantee choosing and continuing throughout duration of patent. Information requirements defined in iEdison. Note: this reporting requirement, if applicable, extends beyond the grant period.	401 14(h)	Submit electronically using iEdison.
Annual Summary Report of Inventions: Summarize all previously reported subject inventions under this grant.	Annually	Invention reports shall be filed annually due no later than 1 July of each year. Grants effective after 31 January will not require a report until 1 July of the following year. The recipient shall use DD Form 882, Report of Inventions and Subcontracts, to file invention reports. If no inventions occurred during the annual reporting period a negative report must be submitted. --Email Form DD882 to dtrabasicresearch@mail.mil (file size must be less than 10MB). File should be named by the Grant number and 'Invention Report' (e.g. HDTRA1-12-1-9999 Invention Report) --The Grant shall not be closed out until all invention reporting requirements are met.	401 5(f)(3)	No iEdison submission allowed. Submit DD Form 882, Report of Inventions and Subcontracts to: --DTRA Grants Officer, 8725 John J. Kingman Rd., MSC 6201 (#2730B), Ft. Belvoir VA 22060-6201 --Administrative Office identified in the Grant --As directed by DTRA, email or portal.
Final Invention Statement and Certification: Report all subject inventions derived or reduced to practice during the performance of the grant.	Due with the Final Technical Report within 90 days after the project ends.	Invention reports shall be filed at the end of the Grant's PoP. If no inventions occurred during the lifetime of the award, a negative report must be submitted. --Email Form DD882 to dtrabasicresearch@mail.mil (file size must be less than 10MB). File should be named by the Grant number and 'Invention Report' (e.g. HDTRA1-12-1-9999 Invention Report). --The Grant shall not be closed out until all invention reporting requirements are met.	401 5(f)(1)	No iEdison submission allowed. Submit DD Form 882, Report of Inventions and Subcontracts to: --DTRA Grants Officer, 8725 John J. Kingman Rd., MSC 6201 (#2730B), Ft. Belvoir VA 22060-6201 --Administrative Office identified in the Grant --As directed by DTRA, email or portal

9. Technical Reporting Requirements.

Research Performance Progress Report (RPPR). Except under rare cases, RPPRs are required annually. The RPPR is due no later than 1 July of each year. Grants effective after 31 January will not require a RPPR until 1 July of the following year.

The RPPR is *not* a cumulative report. The first RPPR shall only include actions that occurred from the Period of Performance start date up to submission of the first RPPR. Each subsequent report shall only include actions that occurred during the 12-month period following the previous year's RPPR.

A RPPR is not required in the final year of the award if the period of performance ends within 60 days of the RPPR due date. In this instance the Final Report will satisfy the requirement. Broadly the RPPR shall address the following items:

- Accomplishments
- Products
- Participants and Other Collaborating Organizations
- Impact
- Changes/Problems

Templates and specific instructions will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). A copy of the RPPR should also be provided to the Administrative Office identified in the Grant. The file names should be as follows:

- RPPR: Year Annual Report Grant Number, e.g. 2017 Annual Report HDTRA1-12-1-9999.
- Metrics: Year Metrics Grant Number, e.g. 2017 Metrics HDTRA1-12-1-9999.

Quad Chart. An updated quad chart must be submitted annually. A template will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). The file name should be as follows:

- Quad Chart: Year Quad Chart Grant Number, e.g. 2017 Quad Chart HDTRA1-12-1-9999.

Annual Technical Review. At least one representative (preferably the PI) for each award is expected to attend and present at an annual technical program review meeting, unless otherwise exempted by DTRA in writing. For planning purposes reviews will typically be for two days in Northern Virginia during the spring or summer months.

Final Technical Report. A comprehensive final technical report is required: the draft document is required forty-five (45) days prior to the end of the Period of Performance and the final document is required ninety (90) days after the expiration or termination of the award.

The purpose of the final report is to document and to transition the results of the effort into the DTRA and DoD applied research community. The final report will always be sent to the Defense Technical Information Center (DTIC) and unclassified reports may be made available to the public through the National Technical Information Service (NTIS).

The final report is more than an extension of previous annual reports. The final report shall be a **comprehensive** technical summary of the significant work accomplished. The final report, where it is not readily accessible in published form should, where applicable:

- Clearly describe and illustrate the experimental equipment, setup, and procedures;
- Characterize and tabulate collected/computed data in an appendix;

- Sufficiently describe computational codes so they can be reproduced. Include a listing of the code in an appendix if possible and appropriate; and
- When the research effort culminates in the production of one or more student theses or dissertations, in these cases, the most significant advancements and conclusions (equations, figures, relationships, etc.) should be included in an executive summary. The theses or dissertations should be attached as appendices only if they are not readily available. If they are, clearly reference them and how they can be obtained. Also include in the executive summary, cumulative lists of people involved in, and publications stemming from, the research effort. Do not include copies of already submitted or published articles in the final report.

Standard Form (SF) 298, Report Documentation Page, must be used. Item 13 of the SF-298 should contain a 100 to 200 word abstract summarizing technical progress during the reporting period. The SF-298 may be found on the Internet at: http://www.gsa.gov/portal/forms/download/116146

All of the report pages should be prepared for acquisition and distribution by DTIC. All of the report pages should be of good quality for copying purposes. No pages should be missing.

The format and standard required by your institution for the preparation of theses and dissertations shall be used for the final report. In the absence of any institutional standards, you may wish to refer to the American National Standards Institute (ANSI) document Z39.18-1987, "Scientific and Technical Reports: Organization, Preparation, and Production," for guidance. The report may be obtained from:

American National Standards Institute, Inc.
1430 Broadway
New York, NY 10018

It is anticipated that all final technical reports will be unclassified and that distribution will not be limited. However, for final technical reports that require a limited distribution as deemed necessary by DTRA, a Distribution List will be provided with the comments on the draft final technical report. The Distribution List should be formatted to match the rest of the report, placed at the end of the report, and added to the Table of Contents. The number of pages in the Distribution List should be added to the total page count and included in the total number of pages cited in Block 15 of the SF-298.

The draft of the final technical report will be due not later than forty-five (45) days prior to the end of the period of performance. The draft of the final technical report (including a draft SF-298) must be submitted electronically as follows:

- Email the draft of the final technical report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Draft Final Report' and the Grant number, e.g. Draft Final Report HDTRA1-12-1-9999.
- Provide a copy of the report to the Administrative Office identified in the Grant.

Within thirty (30) days, this draft will be reviewed by DTRA and comments will be provided to the Grantee to ensure the report complies with DTRA final report requirements. Such review and comment does not restrict the conduct or reporting of the project research

findings/outcomes and, in accordance with Article 35, does not restrict Grantee's ability to publish. Grantee shall incorporate such requested changes so that the report incorporates and complies with agreement final reporting requirements terms. Final Technical Reports are due ninety (90) days after the expiration or termination of the award. The final submission should be made in accordance with the draft final report submission instructions.

Final Metrics. A final metrics table (in MS Excel format) is required. A template and specific instructions will be provided in advance of the submission deadline. The final metrics file should be submitted along with the Final Technical Report. The fields contained in the final metrics file are analogous to those of the annual submissions. The final metrics file shall contain only data from the last annual reporting period until the end of the award's funded Period of Performance.

- Email the final Metrics File to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Final Metrics' and the Grant number, e.g. Final Metrics HDTRA1-12-1-9999.

10. Financial Reporting Requirements.

Federal Financial Reports (SF-425) are due no later than 1 July of each year with data "as of" 30 May of that year. Grants effective after 31 January will not require a Federal Financial Report until 1 July of the following year. All financial reports shall be submitted to the Administration Office identified in Block 6 of the Research Grant. In addition, the Federal Financial Report must be submitted electronically as follows:

- Email the Federal Financial Report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be the Year, 'Federal Financial Report' and the Grant number, e.g. 2015 Federal Financial Report HDTRA1-12-1-9999.

11. Delegation of Administration Duties.

Certain grant administration duties have been delegated to the Administration Office identified in Block 6 of the Research Grant. These duties are as follows:

1) Provisionally approve all Grant and Cooperative Agreement Vouchers.
2) Perform all property administration services except the approval of recipient's requests to purchase equipment with grant funds. Such approvals must be granted by the DTRA Grants Officer.
3) Perform all plant clearance functions.
4) Approve requests for Registration for Scientific and Technical Information Services (DD Form 1540).
5) Obtain all financial report(s) (see Article 10 of this document).
6) Execute administrative closeout procedures, which include the following:
   a. Obtain the final Report of Inventions and Subcontracts (DD Form 882).
   b. Obtain final payment request, if any.
   c. Obtain final property report and dispose of purchased property and government furnished equipment (GFE) in accordance with the DoDGARs Part 22, Subpart G.
   d. Perform a review of final incurred costs and assist the Grants Officer in resolving exceptions, if any, resulting from questioned costs.
   e. Assure that all refunds due the Government are received by the Grantor.

NOTE: This term and condition is **not applicable** to instrumentation and equipment grant awards.

12. Security.

As a general rule, PI's will not need access to classified security information in the conduct of research supported under this Grant. Should it appear that access to such information is desirable the recipient shall advise the Grantor and request clearance for the investigator. Should information be developed during the course of work under this Grant that, in the judgment of the PI or the recipient, should be classified, the Grants Officer shall be notified immediately.

13. Representations and Assurances.

By accepting funds under this Grant, the recipient assures that it will comply with applicable provisions of the national policies and statutory/regulatory/executive-based requirements detailed below.

LIVE ORGANISMS. By signing this agreement or accepting funds under this agreement, the recipient assures that it will comply with applicable provisions of the following national policies concerning live organisms:

1) For human subjects:

   a) Adhere to the requirements for protection of human subjects per the DoD level terms and conditions as well as the following DTRA requirements:
   b) The recipient shall adhere to DTRA local clause 252.223-9002 – Protection of Human Subjects (Aug 2010). The full text of this clause is as follows:

      All research under this grant involving human subjects must be conducted in accordance with 32 CFR 219, 10 U.S.C 980, and DoDD 3216.02, as well as other applicable federal and state regulations. Grantees must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as regards vulnerable populations (32 CFR 219 modifications to subparts B-D of 45 CFR 46), recruitment of military research subjects (32 CFR 219), and surrogate consent (10 U.S.C. 980).

      DTRA Directive 3216.01 of June 9, 2010 establishes the DTRA Human Subjects Protection Program, sets forth the policies, defines the applicable terms, and delineates the procedures necessary to ensure DTRA compliance with federal and DoD regulations and legislation governing human subject research. The regulations mandate that all DoD activities, components, and agencies protect the rights and welfare of human subjects of study in DoD-supported research, development, test and evaluation, and related activities hereafter referred to as "research". The requirement to comply with the regulations applies to new starts and to continuing research.

      The DTRA directive requires that research using human subjects may not begin or continue until the Defense Threat Reduction Agency's Research Oversight Board (ROB) has reviewed and approved the proposed protocol. Grantees and subcontractors are required to submit a valid federal assurance for their organization

(institution, laboratory, facility) that has been issued by either DoD or the Department of Health and Human Services, and documentation of review of proposed protocols by the local Institutional Review Board (IRB) to include consent forms for any planned research using human subjects to the DTRA ROB for its review through the Grants Officer's representative (if assigned) or the Grants Officer. The ROB review is separate from, and in addition to, local IRB review.

A study is considered to involve human research subjects if: 1) there is interaction with the subject (simply talking to the subject qualifies; no needles are required); and 2) if the study involves collection and/or analysis of personal/private information about an individual, or if material used in the study contains links to such information.

Written approval to begin research or subcontract for the use of human subjects under the proposed protocol will be provided in writing from the DTRA ROB, through the Grants Officer. A copy of this approval shall be maintained by both the Grantee and the government. Any proposed modifications or amendments to the approved protocol or consent forms must be submitted to the local IRB and the DTRA ROB for review and approval. Examples of modifications/ amendments to the protocol include but are not limited to:

- a change of the PI;
- changes in duration or intensity of exposure to some stimulus or agent;
- changes in the information requested of volunteers, or changes to the use of specimens or data collected; or
- changes in perceived or measured risks or benefits to volunteers that require changes to the study.

Research pursuant to such modifications or amendments shall not be initiated without IRB and ROB approval except when necessary to eliminate apparent and immediate hazards to the subject(s).

Research projects lasting more than one year require IRB review at least annually, or more frequently as required by the responsible IRB. ROB review and approval is required annually. The Grantee or subcontractor must provide documentation of continued IRB review of protocols for ROB review and approval in accordance with these Terms and Conditions. Research must not continue without renewed ROB approval unless necessary to eliminate apparent and immediate hazards to the subject(s).

Non-compliance with any provision of this clause may result in withholding of payments under the grant pursuant to the grant's payments clause(s) and/or grant termination pursuant to the grant's termination clause(s). The government shall not be responsible for any costs incurred for research involving human subjects prior to protocol approval by the ROB.

2) For animals:

   a. Adhere to the requirements for protection of animal subjects per the DoD level terms and conditions as well as the following DTRA requirements:

b. DTRA local clause 252.235-9001 – Prohibition of Use of Laboratory Animals (Jul 2010). The full text of this clause is as follows:

The grant recipient shall obtain approval from the US Army Medical Research and Material Command (MRMC), Animal Care and Use Review Office (ACURO) prior to conducting research on live nonhuman vertebrates. Studies involving non-human primates, dogs, cats, or marine mammals will require a site visit by an ACURO laboratory animal veterinarian as a condition of approval. DoD may also conduct site visits involving research on other animals when deemed appropriate. The animal research facility is responsible for notifying the DoD sponsor if Association for the Assessment and Accreditation of Laboratory Animal Care accreditation is lost or the facility is under USDA inspection. DoD also has the right to a site inspection under these circumstances.

The grant recipient (including subcontractors) is expressly forbidden to use laboratory animals in any manner whatsoever without the express written approval of MRMC ACURO.

The grant recipient shall complete the ACURO Animal Use Appendix for Research Involving Animals found at the following web site: http://mrmc.amedd.army.mil/index.cfm?pageid=research_protections.acuro_animalappendix. Submit the completed ACURO appendix, contact information, the DTRA grant number and a copy of the grant for processing to the email address listed at the ACURO website. Once ACURO approves the effort, the grant recipient will receive written approval to begin animal use from the US Army MRMC ACURO by separate email. The grant recipient shall promptly provide a copy of the approval to the Grants Officer and Grants Officer representative. After approval, changes or protocol amendments must be submitted to and approved by ACURO before implementation.

The grant recipient, or subcontractors as appropriate, shall submit the most recent U.S. Department of Agriculture Animal Care Inspection Report annually in accordance with instructions provided.

Non-compliance with any provision of this clause may result in termination of the grant.

DoD Instruction 3216.01, dated September 13, 2010, provides policy and requirements for the use of animals in DoD-funded research based on Army Regulation 40-33. The DoD definition of animal is any live nonhuman vertebrate. All proposals that involve the use of animals must be in compliance with DoD Instruction 3216.01 and AR 40-33. DTRA requires that research using animals not begin or continue until the ACURO has reviewed and approved the proposed animal use. For animals, the provisions include rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Action of 1966 (U.S.C. 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23

RESEARCH INVOLVING RECOMBINANT DNA MOLECULES. Any recipient performing research involving recombinant DNA molecules and/or organisms and viruses

containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," July 5, 1994 (59 FR34496) amended August 5, 1994 (59 FR40170) amended April 27, 1995 (60 FR 20726), or such later revision of those guidelines as may be published in the Federal Register.

COMBATING TRAFFICKING IN PERSONS. The recipient agrees to comply with the trafficking in persons requirement in Section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)) as implemented by 2 CFR 175.

1) Provisions applicable to a recipient that is a private entity.

   a. You as the recipient, your employees, sub-recipients under this award, and sub-recipients' employees may not—
      - Engage in severe forms of trafficking in persons during the period of time that the award is in effect;
      - Procure a commercial sex act during the period of time that the award is in effect; or
      - Use forced labor in the performance of the award or subawards under the award.

   b. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a sub-recipient that is a private entity—
      - Is determined to have violated a prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph 1)a. of this award term through conduct that is either
        - Associated with performance under this award; or
        - Imputed to you or the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

2) Provision applicable to a recipient other than a private entity.

   a. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a sub-recipient that is a private entity—
      - Is determined to have violated an applicable prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph 1)a. of this award term through conduct that is either
        - Associated with performance under this award; or
        - Imputed to the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide

Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

3) Provisions applicable to any recipient.

   a. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph 1)a. of this award term.

   b. Our right to terminate unilaterally that is described in paragraph 1)b. or 2)a. of this Article:
      - Implements Section 106(g) of the TVPA, as amended (22 U.S.C. 7104(g)), and
      - Is in addition to all other remedies for noncompliance that are available to us under this award.

   c. You must include the requirements of paragraph 1)a. of this award term in any subaward you make to a private entity.

4) Definitions. For purposes of this award term:

   a. "Employee" means either:
      - An individual employed by you or a sub-recipient who is engaged in the performance of the project or program under this award; or
      - Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

   b. "Forced labor" means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

   c. "Private entity":
      - Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.
      - Includes:
        - A non-profit organization, including any non-profit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
        - A for-profit organization.

   d. "Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at Section 103 of the TVPA, as amended (22 U.S.C. 7102).

PROHIBITION ON USING FUNDS UNDER GRANTS AND COOPERATIVE AGREEMENTS WITH ENTITIES THAT REQUIRE CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS. The recipient agrees to comply with the requirements in section 743 of the Financial Services and General Government Appropriations Act, 2015 (Division E of the Consolidated and Further Continuing Appropriations Act, 2015, Pub. L. 113-235):

1) The recipient may not require its employees, contractors, or sub-recipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.
2) The recipient must notify its employees, contractors, or sub-recipients that the prohibitions and restrictions of any internal confidentiality agreements inconsistent with paragraph 1) of this award provision are no longer in effect.
3) The prohibition in paragraph 1) of this award provision does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.
4) If the Government determines that the recipient is not in compliance with this award provision, it:
    a. Will prohibit the recipient's use of funds under this award, in accordance with section 743 of Division E of the Consolidated and Further Continuing Resolution Appropriations Act, 2015, (Pub. L. 113-235) or any successor provision of law; and
    b. May pursue other remedies available for the recipient's material failure to comply with award terms and conditions.

14. Data Collection.

Data collection activities, if any, performed under this Grant are the responsibility of the recipient. Awarding agency support of the project does not constitute approval of the survey design, questionnaire content, or data collection procedures. The recipient shall not represent to respondents that such data are being collected for or in association with the awarding agency without the specific written approval of the cognizant awarding agency official. However, this requirement is not intended to preclude mention of the awarding agency support of the project in response to an inquiry or acknowledgment of such support in any publication of this data.

15. Publications and Acknowledgement of Sponsorship.

Publication of results of the research project in an appropriate professional journal is encouraged as an important method of recording and reporting scientific information. .

The recipient agrees that in the release of information relating to the grant, such release shall include the following statement, "The project or effort depicted was or is sponsored by the Department of the Defense, Defense Threat Reduction Agency. The content of the information does not necessarily reflect the position or the policy of the federal government, and no official endorsement should be inferred." For purposes of this provision, information includes news releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, symposia, etc.

When issuing statements, press releases, requests for proposals, bid solicitations, and other documents describing projects or programs funded in whole or in part with federal money, all recipients receiving federal funds, shall clearly state: (i) the percentage of total costs of the

program or project which will be financed with federal money, and (ii) the dollar amount of federal funds for the project or program.

16. Authorization to Perform Activities Abroad.

If the award recipient is a foreign institution, the recipient assures that it has been duly authorized to operate and do business in the country or countries in which the grant is to be performed; that it has obtained all appropriate licenses, permits, and approvals required in connection with the grant's proposed activities; and that it will fully comply with all the laws, decrees, labor standards and regulations of such country or countries during the performance of the grant. U.S. Government funds may not be used in support of a project which is prohibited by law in the country or countries in which it is undertaken. DTRA does not assume responsibility for the recipient's compliance with the laws and regulations of the country or countries in which the activities are to be conducted.

17. Inconsistency between English Version and Translation of Grant.

The foreign recipient shall ensure that all contract correspondence that is addressed to the U.S. Government is submitted in English or with an English translation. In the event of inconsistency between the terms of the grant and any translation thereof into another language, the meaning in the English language shall control.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00001	24-May-2017	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/J4C 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. SAGAR GOYAL 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 14-Apr-2017

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended. ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

X B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not. ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: fountain171744
RQN: J3CTB23032A

The purpose of this modification is to correct the payment office by changing it to DFAS-Columbus North HQ0337.

All other terms and conditions remain unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 25-May-2017

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The 'Payment will be made by' organization has changed from

DFAS COLUMBUS CENTER
DFAS-CO/SOUTH ENTITLEMENT OPERATIONS
P.O. BOX 182317
COLUMBUS OH 43218-2264

to

DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182266
COLUMBUS OH 43218-2266

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00002	01-Dec-2017	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. DR. JON EPSTEIN 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 14-Apr-2017

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
DTRA Terms and Conditions

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: fountain172493
Please see SF 30 Continuation Page

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) / CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 27-Nov-2017

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00002	01-Dec-2017	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. DR. JON EPSTEIN 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
	X	10B. DATED (SEE ITEM 13) 14-Apr-2017
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended. ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
DTRA Terms and Conditions

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not. ☒ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: fountain172493
Please see SF 30 Continuation Page

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Aleksei Chmura, Authorized Organizational Representative	TEL: EMAIL:

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
Aleksei Chmura (Signature of person authorized to sign)	**22 Nov 2017**	BY (Signature of Contracting Officer)	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION SF 30 - BLOCK 14 CONTINUATION PAGE

The following have been added by full text:
SF 30 CONTINUATION PAGE

RQN: HDTRA1723032 002

The purpose of this modification is to do the following:

1.) Notate and provide acceptance of the EHA's revised budget of $4,065,665.00.
2.) Increase the award amount by $154,246.95 to reflect the budget increasing from $3,911,418.05 to $4,065,665.00.
3.) Provide additional funding to CLIN 0001 in the amount of $156,044.00 to subCLIN 000103, ACRN AC.
4.) Correct and update the Grant Funding Profile and Invoice Schedule.
5.) Update the Grant Points of Contact.
6.) Update the Issuing and Payment Offices.

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $91,758.55 from $2,408,373.45 to $2,500,132.00.
The 'issued by' organization has changed from
DEFENSE THREAT REDUCTION AGENCY/J4C
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201
to
DEFENSE THREAT REDUCTION AGENCY/AL-AC
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201

The 'Payment will be made by' organization has changed from
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182266
COLUMBUS OH 43218-2266
to
DFAS COLUMBUS CENTER
DFAS-CO/NORTH ENTITLEMENT OPERATIONS
P.O. BOX 182317
COLUMBUS OH 43218-2317

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0001
The CLIN description has changed from FRBAA14-6-2-0050_R: Base Year to FRBAA14-6-2-0050_R: Three Year Base.

The estimated/max cost has increased by $91,758.55 from $2,408,373.45 to $2,500,132.00.
The total cost of this line item has increased by $91,758.55 from $2,408,373.45 to $2,500,132.00.

CLIN 0002

The estimated/max cost has increased by $33,355.07 from $767,080.93 to $800,436.00.
The total cost of this line item has increased by $33,355.07 from $767,080.93 to $800,436.00.

CLIN 0003

The estimated/max cost has increased by $29,134.33 from $735,963.67 to $765,098.00.
The total cost of this line item has increased by $29,134.33 from $735,963.67 to $765,098.00.

SUBCLIN 000103 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000103					$0.00
	Incremental Funding COST Incremental funding in the amount of $156,044.00.				
				ESTIMATED COST	$0.00
	ACRN AC				$156,044.00
	CIN: HDTRA17230320020003				

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000103:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $156,044.00 from $766,817.00 to $922,861.00.

SUBCLIN 000103:
Funding on SUBCLIN 000103 is initiated as follows:

ACRN: AC

CIN: HDTRA17230320020003

Acctng Data: 044315 097 0134 000 N 20162018 D 34HQ 0901515BR_KD_BP_OT 1618_0134_34HQ_SCNCT DTRA 410

Increase: $156,044.00

Total: $156,044.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4CO
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. Grantee Business Office:
Name: Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. Jonathan H Epstein
Title: Associate Vice President, Conservation
Phone: (212) 380-4467
E-mail: epstein@ecohealthalliance.org

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:

The amount of $922,861.00 is obligated for work to be performed during the period beginning with grant award and continuing through April 30th, 2018. Additional incremental funding planned, but not obligated, is:

Year 1 (FY17-18) $0.00
Year 2 (FY18-19) $833,274.00
Year 3 (FY19-20) $743,997.00

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE:

INVOICE NO.	INVOICE DATE	PAYMENT
1	August 01, 2017	$76,905.08

2	September 01, 2017	$76,905.08
3	October 01, 2017	$76,905.08
4	November 01, 2017	$76,905.08
5	December 01, 2017	$76,905.08
6	January 01, 2018	$76,905.08
7	February 01, 2018	$76,905.08
8	March 01, 2018	$76,905.08
9	April 01, 2018	$76,905.08
10	May 01, 2018	$76,905.08
11	June 01, 2018	$76,905.08
12	July 01, 2018	$76,905.12

**The amounts listed are estimates; invoices should be submitted for actual cost incurred.

The following have been deleted:

252.232-7007
252.232-7007

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 7

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00003	25-May-2018	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-ACO 8725 JOHN J.KINGMAN RD FT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
	X	10B. DATED (SEE ITEM 13) 14-Apr-2017
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14. PURSUANT TO THE AUTHORITY OF FAR 43.103(B).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: DTRA Terms and Conditions
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not. ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: rodgrigt18865

RQN: HDTRA1723032 03

The purpose of this modification is to:

1. Notate and provide acceptance of the overall revised budget of $4,115,665.00.
2. Increase the award amount by $50,000.00 to reflect the budget increasing from $4,065,665.00 to $4,115,665.00.
3. Provide funding in the amount of $408,006.00 on subCLIN 000103 in support of Year 2 activities on CLIN 0001.
4. Provide funding in the amount of $475,268.00 on subCLIN 000104 in support of Year 2 activities on CLIN 0001.
5. Update the invoice schedule and Grant Officer's Representative (GOR).
6. Update the Terms and Conditions.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
	(b)(6) / CONTRACTS OFCR-GRANTS OFCR TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	25-May-2018

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $50,000.00 from $2,500,132.00 to $2,550,132.00.
The 'issued by' organization has changed from
DEFENSE THREAT REDUCTION AGENCY/AL-AC
8725 JOHN J. KINGMAN ROAD, MSC 6201
FORT BELVOIR VA 22060-6201
to
DEFENSE THREAT REDUCTION AGENCY/AL-ACO
8725 JOHN J.KINGMAN RD
FT BELVOIR VA 22060-6201

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0001
The CLIN extended description has changed from:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B.

To:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 6 April 2018 at Exhibit B.

.

The estimated/max cost has increased by $50,000.00 from $2,500,132.00 to $2,550,132.00.
The total cost of this line item has increased by $50,000.00 from $2,500,132.00 to $2,550,132.00.

SUBCLIN 000103
The CLIN extended description has changed from:

Incremental funding in the amount of $156,044.00.

To:

Incremental funding in the amount of $564,050.00.

.

CLIN 0002

The CLIN extended description has changed from:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B.

To:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 6 April 2018 at Exhibit B.

.

CLIN 0003

The CLIN extended description has changed from:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 31 October 2016 at Exhibit B.

To:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 6 April 2018 at Exhibit B.

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SUBCLIN 000104 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000104					$0.00
	Incremental Funding COST Incremental funding in the amount of $883,274.00.				
				ESTIMATED COST	$0.00
	ACRN AD CIN: HDTRA172303203000104				$475,268.00

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000104:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by S883,274.00 from S922,861.00 to $1,806,135.00.

SUBCLIN 000103:

AC: 044315 097 0134 000 N 20162018 D 34HQ 0901515BR_KD_BP_OT 1618_0134_34HQ_SCNCT DTRA 410 (CIN HDTRA17230320020003) was increased by $408,006.00 from $156,044.00 to $564,050.00

SUBCLIN 000104:
Funding on SUBCLIN 000104 is initiated as follows:

ACRN: AD

CIN: HDTRA172303203000104

Acctng Data: 044315 097 0134 000 N 20172019 D 34HQ 0901515BR KD BP2 OT 1719 0134 34HQ SCNCT DTRA 410

Increase: S475,268.00

Total: $475,268.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4CO
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. Grantee Business Office:
Name: Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. Jonathan H Epstein
Title: Associate Vice President, Conservation
Phone: (212) 380-4467
E-mail: epstein@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:

Name: (b)(6) DNM MA
Defense Threat Reduction Agency/PI-CTB
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:

The amount of $1,806,135.00 is obligated for work to be performed during the period beginning with grant award and continuing through April 30th, 2019. Additional incremental funding planned, but not obligated, is:

Year 3 (FY19-20) $743,997.00

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE:

INVOICE NO.	INVOICE DATE	PAYMENT*
1	May 31, 2018	$73,606.17
2	June 30, 2018	$73,606.17
3	July 31, 2018	$73,606.17
4	August 31, 2018	$73,606.17
5	September 30, 2018	$73,606.17
6	October 31, 2018	$73,606.17
7	November 30, 2018	$73,606.17
8	December 31, 2018	$73,606.17
9	January 31, 2019	$73,606.16
10	February 28, 2019	$73,606.16
11	March 31, 2019	$73,606.16
12	April 30, 2019	$73,606.16

*The amounts listed above are estimates; invoices should be submitted for actual costs incurred.

SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

The Table of Contents has changed from:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	8	01-MAY-2016
Exhibit B	DTRA Terms and Conditions	17	31-OCT-2016

to:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	8	01-MAY-2016
Exhibit B	DTRA Terms and Conditions	18	06-APR-2018

(End of Summary of Changes)

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein
CBEP-Thrust Area 6, CC WMD

Statement of Work

Project Title: Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Document Date: April 11 2019

Objective: The objective of this project is to enhance capacity within the Malaysia government to characterize the distribution of and detect spillover of novel and known henipaviruses and filoviruses, (both groups include high consequence zoonotic pathogens) in indigenous populations and farms in Peninsular Malaysia. Current surveillance strategies for novel zoonotic viruses rely exclusively on molecular detection tools, but Nipah and Ebola viruses are present at low prevalence in bat species which makes infected individuals difficult to detect. By establishing a multiplexed serological assay developed to detect antibodies against any henipa- and filoviruses, the Government of Malaysia (GoM) will more effectively be able to determine the distribution of these high-impact viruses in wildlife reservoirs and detect evidence of spillover in at-risk human or livestock populations. This enhancement of human and animal surveillance in all three sectors (wildlife, livestock and human health) and training of Malaysian scientists utilizes a One Health approach and will help reduce risk of zoonotic disease emergence and spread by accelerating detection and response. These activities fulfill DTRA CBEP's mandate and are also complementary to and supportive of the aims of the USAID EPT program and the Global Health Security Agenda.

Scope: This research includes transferring state-of-the art serological reagents and Luminex-based microsphere beaded technology that will allow the Government of Malaysia to use a One Health approach to conduct serological surveillance for all known *and unknown* henipaviruses and filoviruses in wildlife, domestic animals, and humans. The study will test archived human and wildlife serum samples which are linked to PCR-tested oral, rectal, or urogenital swab samples (collected and tested under the ongoing USAID Emerging Pandemic Threats: PREDICT program and a University of Malaya study of Orang Asli healthy populations and acutely febrile hospital cases). It will also conduct a new study looking at henipa- and filovirus antibodies in livestock and farm workers and wildlife near the farms, as well as an expanded Orang Asli study focused on hunting communities living in the forest. The grantee will investigate spillover of these pathogens by screening wildlife reservoirs (e.g. bats and nonhuman primates), people, and livestock for IgG antibodies to henipaviruses and filoviruses, while also continuing to develop and transfer additional tests that will detect antibodies against novel viruses in these groups.

Our team will focus on the following major goals and milestones:

1. Improve the Government of Malaysia's capacity to conduct serological surveillance for henipaviruses and filoviruses in human and animal populations, using a One Health approach.
    - Transfer Luminex-based technology into government and university diagnostic labs in three key sectors (wildlife, livestock, and human health); conduct trainings for staff to be able to screen samples, interpret results, and perform confirmatory assays; train local graduate students; and publish and share findings among GoM partners.
2. Determine the host distribution and seroprevalence of henipaviruses and filoviruses in wildlife (e.g. bat) populations in Peninsular Malaysia associated with Orang Asli communities and livestock farms.

- Conduct cross-sectional serological studies of humans and animals for henipa- and filoviruses by testing sera from new samples collected under this project and archived samples from PREDICT. Wildlife sampling will be conducted jointly with the Dept. of Wildlife and National Parks (DWNP); livestock sampling with DVS and UPM; and human sampling with MoH. These activities provide opportunity for One Health-based disease surveillance; threat reduction; and capacity building within the Government of Malaysia.

3. Conduct surveillance for IgG antibodies against filoviruses and henipaviruses in people and domestic animals which may indicate spillover from wildlife reservoirs. Sampling activities will focus on Orang Asli communities and farms in Peninsular Malaysia and will be conducted jointly with the Ministry of Health's National Public Health Laboratory (NPHL), DWNP, and the University Putra Malaysia under the Department of Veterinary Services (DVS). Serological surveillance will allow the GoM to focus limited resources and develop interventions to reduce threat from viral outbreaks in at-risk animal and human populations.

- Qualitative studies (e.g. questionnaires) detailing human-animal contact where sampling occurs will characterize high-risk behaviors and interfaces;
- Sampling human, wildlife, and domestic animal populations in Orang Asli forest communities that practice hunting.
- Sampling domestic animals and farm workers on large and small-scale farms and associated wildlife to identify evidence of spillover.

Our research will be focused on building capacity within the Government of Malaysia to conduct serological surveillance in human and animal populations in Peninsular Malaysia where people and animals are believed to have high levels of contact. Collaborators from the Government of Malaysia (GoM)'s Department of Wildlife and National Parks (DWNP), the Ministry of Health's National Public Health Laboratory (NPHL), the Department of Veterinary Service's University Putra Malaysia (UPM), University of Malaysia (UM), The Uniformed Services University, Maryland (USU), Conservation Medicine, Ltd. (CM), The US Navy Medical Research Center, Asia (NMRC-A), and Duke-NUS Graduate Medical School, Singapore (Linfa Wang lab) will play active roles in this research. EHA's history of successful collaboration with DWNP, MoH, and DVS under prior research projects and most recently through PREDICT, as well as having a Memorandum of Agreement with the aforementioned institutions, gives us confidence that we will be able to achieve the aims of this proposal (also see letters of collaboration).

The duration of the proposed project is three years, with optional 4th and 5th years containing follow-up Orang Asli studies and farm studies so that we have longitudinal data. These option years will significantly strengthen the overall study by enhancing our ability to detect temporal patterns of infection in bat and other animal populations as well as additional opportunity to detect spillover in humans or livestock. **Through these proposed activities we would create enhanced One Health surveillance for known *and novel* henipaviruses and filoviruses in human and animal populations in Peninsular Malaysia, an emerging disease hotspot.** The proposed activities would significantly support Malaysia's surveillance priorities, DTRA CBEP Thrust Area 6 objectives, the Global Health Security Agenda (GHSA), and the USAID Emerging Pandemic Threats program by allowing the Government of Malaysia to more rapidly detect infections of high impact zoonotic agents and develop effective interventions to prevent viral

outbreaks and reduce human and animal mortality, thereby reducing the threat from these high consequence viral agents.

Background:

Nipah virus (NiV), Ebola virus (EBOV) and Marburg Virus (MARV) are emerging zoonotic viruses belonging to the genera *Henipavirus* (Family *Paramyxoviridae*), *Ebolavirus* and *Marburgvirus* (both Family *Filoviridae*) and they have each caused outbreaks in people with high mortality rate. These viruses are listed as a select agents by HHS and USDA as pathogens of significant threat to both human and animal health. Nipah virus (NiV) is a zoonotic paramyxovirus (genus *Henipavirus*) with pandemic potential that first emerged on a pig farm in Malaysia in 1997 and led to a human outbreak with more than 260 cases and 40% mortality. Old world frugivorous bats, particularly Genus *Pteropus* (Family *Pteropodidae*), are natural reservoirs for a range of henipaviruses, including Nipah virus. Filoviruses circulate both in Africa and Southeast Asia, and have also been linked to bat reservoirs. In Africa, EBOV and Sudan virus (SUDV) have caused multiple human outbreaks with mean mortality rates between 50% and 90%. The current EBOV outbreak in West Africa, by far the largest Ebola epidemic in history, has had more than 28,600 cases, primarily in Sierra Leone, Guinea, and Liberia, with a mortality rate of 40%. The outbreak in West Africa has prompted the Government of Malaysia to determine whether filoviruses are circulating in bat species resident in Peninsular Malaysia. Malaysia's experience with Nipah virus, existing technical expertise, and its current commitment to using a One Health approach to disease surveillance (e.g. surveillance for novel zoonoses under PREDICT in all three sectors: wildlife, livestock, and human health) make it an ideal place to establish an advanced serological platform for detection of henipavirus and filovirus antibodies in wildlife and at-risk livestock and human populations.

Preliminary data: Serological studies of Nipah virus and Ebola virus using the Luminex-based platform. Studies conducted by our group have shown that NiV viral prevalence in pteropid bats is low (~1%-3%) and there is temporal variation to shedding. Mean seroprevalence in *P. vampyrus*, which is found across Peninsular Malaysia was 32% (n=253; range 16.7% - 42.4%). In Bangladesh, we conducted a 6-year longitudinal study of *Pteropus giganteus* using the Luminex-based platform to screen bats for IgG antibodies against both Nipah virus and Ebola virus Zaire. Between 20% and 80% of adult *Pteropus giganteus* were NiV seropositive, while between 20% and 50% were EBOV seropositive (Epstein et al, *in prep*). Nipah virus infections appear to peak in June/July while EBOV appears to peak in December (see also Project Narrative). We found a diversity of genetic strains of Nipah virus in *P. giganteus* (Epstein et al., *in prep*), and viruses which are NiV-like but distinct henipaviruses. Non-neutralizing antibodies against NiV-like viruses found in goats, cattle, and pigs in Bangladesh suggests that spillover from bats to domestic animals occurs and that there is a broad spectrum of henipaviruses circulating in bats. RESTV RNA was recently identified by our group in *Mineopterus schreibersii,* a common insectivorous bat. We also detected RESTV antibodies in two fruit bat species: *Cynopterus brachyotis* and *Pteropus vampyrus:* the latter is a NiV reservoir. In Bangladesh, we found antibodies against EBOV and RESTV in 3.5% of *Rousettus leschenaultii* (n=141). *M. schreibersii*, *R. leschenaultii,* and two *Pteropus* species, including *P. vampyrus* all occur in Malaysia, yet there is no data available regarding filoviruses in wildlife in Malaysia. The possibility that multiple henipaviruses or filoviruses capable of infecting people or livestock

to be circulating in bats in Malaysia makes enhanced surveillance and early detection of these high consequence viruses critically important for reducing their threat to public health.

PREDICT

Between 2009 and 2015, EHA, CM, and the Department of Wildlife and National Parks (DWNP) have collected and archived samples, including serum, from more than 1,400, animals including bats, rodents, and macaques – all from areas where people and wildlife come into contact. While oropharyngeal, urogenital, and rectal swab samples have been or will be screened using PCR assays for viral families (including paramyxoviruses and filoviruses), corresponding sera remain archived (and untested) and will be made available for this project to test them using the Luminex-based assay.

University Malaya study of acutely ill Orang Asli patients.

We will also have access to archived and newly collected Orang Asli samples collected from acutely febrile patients at Gombak Hospital that serves the Orang Asli communities, under a separate ongoing disease study at the University of Malaya (Prof. Abu Bakar) and NMRC-A (Co-PI Pike). This study just received renewed funding to continue sampling febrile patients and expand to sample asymptomatic Orang Asli from communities across a land-use gradient, which will include individuals without animal exposure. Under this proposal we will screen sera collected from well characterized Orang Asli patients and community members using the Luminex-based platform.

Key references (Further references are available in the Project Narrative):

Luby, S.P., The pandemic potential of Nipah virus. *Antiviral Research*, 2013. 100(1): p. 38-43.

Olival, K.J. and D.T.S. Hayman, Filoviruses in Bats: Current Knowledge and Future Directions. *Viruses*-Basel, 2014. 6(4): p. 1759-1788.

Sarah I. Jayme, et al., Molecular evidence of Ebola Reston virus infection in Philippine bats. *Virology Journal*, 2015. 12(107): p. 1-8.

Sohayati A. Rahman, et al. Risk Factors for Nipah Virus Infection among Pteropid Bats, Peninsular Malaysia. *Emer. Infect. Dis.*, 2013. DOI: 10.3201/eid1901.120221.

***Tasks/Scientific Goals:* (Format: Year #(s). Task #. Sub-task#)**

Task 1: (Year 1-OY5). Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. The GoM has been engaged in using a One-Health approach to zoonotic disease surveillance since the NiV outbreak in 1998 and most recently via collaborations with EHA under PREDICT. However, current GoM and PREDICT surveillance activities in humans, wildlife and domestic animals are based on broad molecular assays designed to identify novel viruses (including henipaviruses and filoviruses). One of the challenges with this approach is that Nipah, Ebola, and related viruses tend to be acute and asymptomatic infections in bats, making detection of viral RNA challenging. IgG antibodies,

however, persist in bats (as well as people and livestock), reducing the sampling effort necessary to identify exposed or infected individuals in a population and also allowing for detection of asymptomatic carriers. Adding a serological component to existing surveillance will greatly enhance the government's ability to detect both known and unknown henipa- and filoviruses in wildlife, domestic animals and human populations at risk for spillover. To establish this capacity, we will provide a BioRad Bio-Plex 200 machine with computer console to NPHL and DWNP. We will provide all reagents for henipa- and filovirus assays. Following Bio-Plex installation, we will conduct a 10-day training course for lab technicians at DWNP and another at NPHL. UM has a Luminex machine and will receive assay reagents and lab staff will participate in one of the training workshops. 1 PhD student at USU will develop additional assay reagents in Y1-OY5. We will identify *either* 1 PhD or 2 Masters' students at UM and 1 PhD student at UPM to train under this project. We will provide additional training to technical staff from GoM partner labs in viral pseudo-type assay development at USU. The grantee shall:

1.1.1. Transfer BioRad Bio-Plex 200 to NPHL and DWNP labs;

1.1.2-2.1.2. Transfer Luminex-based filovirus and henipavirus reagents to DWNP, NPHL, and UM labs; the grantee will provide a BioRad Bio-Plex 200 to UPM and conduct a 10-day training workshop in Y2.

1.1.3.-2.1.3 Train lab staff to use Luminex-based assays

1.1.4- OY5.1.4 Supervise 1 UM PhD or 2 Masters' students (Y1-3), and 1 UPM PhD student

1.1.5-OY5.1.5 Convene the Science Advisory Group (annually in KL);

1.1.6-2.1.6 Develop a database for serology results and sample metadata; establish sample repository at partner labs.

Task 2. (Y1-OY5) Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. At USU, we will engineer soluble and secreted versions of henipa- and filovirus glycoproteins, expressed in mammalian cell culture systems to accurately reflect proper synthesis including their assembly and processing into properly glycosylated higher order complexes. Constructs will be designed and tested in pilot experiments for expression and analysis, and then used to establish stably expressing cell lines. Preparative amounts of the various soluble viral glycoproteins will be made using serum-free culture conditions in suspension culture, and proteins are purified using the appropriate tag protocol (either S-tag or double strep tag (TST)) by affinity chromatography, followed by concentration and size exclusion chromatography. We will test the utility of each individual glycoprotein by Luminex, ELISA and Western blotting then provide all necessary reagents to partner labs to accomplish the testing under this project. The grantee shall:

1.2.1-2.2.1 produce Mojaing virus (MojV) and African GH-M74a G glycoproteins; Bundibugyo virus (BDBV), Tai Forest virus (TAFV), Lloviu virus (LLOV), MARV Ravn, SUDV, SUDV GpΔmucin, RESTV (monkey), and RESTV (porcine) Gp glycoproteins.

1.2.2-3.2.2 use the completed viral glycoprotein preparations and produce polyclonal rabbit serum to each individual glycoprotein; test the utility of each individual glycoprotein by Luminex-based, ELISA and Western blotting assays;

1.2.3 Provide N protein reagents to detect novel henipa- and filoviruses to partner labs.

1.2.4-OY5.2.4: If novel henipa- or filoviruses are detected using molecular assays (under

PREDICT), grantee may develop new reagents for antibodies against these viruses and negative sera will be re-screened.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform (Y1-Y2). Grantee shall test up to 945 macaque and 175 bat archived serum samples collected under PREDICT and stored at DWNP, and up to 300 archived Orang Asli samples stored at NPHL, and up to 200 Orang Asli samples at UM. The number of samples will depend on available serum volume and quality. Results will be used to inform the Orang Asli and farm studies described in **Tasks 4 and 5**. Positive sera may be sent for confirmatory testing at USU using pseudovirus serum neutralization assays, ELISA, or Western blot. Results shall be entered into a database and shared with GoM partners.

1.3.1 Identify suitable archived animal and human sera;
1.3.2 Screen sera for henipa- and filovirus IgG antibodies at GoM and UM partner labs;
1.3.3 Confirm positive results using western blot or pseudovirus assay;
1.3.4 Enter results into database and analyze;
1.3.5-2.3.5 share results with partners.

Task 4. Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. (Y1-OY5). Indigenous communities living in forested areas and that practice subsistence wildlife hunting are at higher risk of exposure to zoonotic viruses due to handling and butchering wildlife and therefore contact with bodily fluids. In **Y1** of this project, we will apply for IRB ethical approval to continue and expand from a pilot study currently underway (expected completion: Oct 2016). Pending IRB and IACUC approval, CM, MoH, and DWNP will work together in **Y1-Y2** to sample 100 individuals from each of 3 Orang Asli communities in Perak State (incl. Kuala Lipis and Gua Musang), **totaling 600 human blood samples over five years**. 100 people sampled per community will allow us to detect a seropositive individual with 95% confidence at a prevalence of 3%, assuming a population of 500 individuals. We will also aim to sample blood from 50 bats per each of 3 species around each study village (e.g. *Miniopterus*, *Pteropus*, and *Rousettus* spp); 30 nonhuman primates; and 30 dogs, if present, in order to be able to detect henipa- or filovirus antibodies in an individual with 95% confidence given a 5% seroprevalence (in bats) and 10% in dogs and nonhuman primates. MOH officers and CM will collect blood from Orang Asli and associated animals, and serum will be separated either in the field or at partner labs and stored at -86C at prior to testing. A sample size of 50 bats would allow us to detect differences between study locations (or time points, should we conduct follow-up studies) of 56% with 95% confidence and 80% precision. The grantee shall conduct repeated sampling of Orang Asli and peri-domestic livestock and wildlife in the same communities in Y3-OY4. If novel henipa or filoviruses identified by PREDICT, new assays will be developed in OY4 and negative samples re-tested. Molecular and serological data from Orang Asli will be co-analyzed in OY4-OY5. In addition, we will test sera collected through an ongoing UM study of Orang Asli. Up to 500 samples per year will be collected Y1-OY5, and these will be tested using the Luminex-based platform at UM. Positive samples will be confirmed at UM or USU.

<u>The grantee shall:</u>

1.4.1.-OY5.4.1 Test Orang Asli, wildlife, and peri-domestic animal samples collected under PREDICT and UM studies
1.4.2-2.4.2, Y3.4.2, OY4.4.2-OY5.4.2. Enter results into database and analyze data;
1.4.3 – 2.4.3, Y3.4.3, OY4.4.3 Confirm sero-positive samples;

1.4.4. Develop follow-up study with GoM partners to be implemented in Y3.
2.4.5 Apply for IRB and permits for follow-up study
3.4.6 Implement repeated sampling in Orang Asli villages
3.4.7 Analyze longitudinal data
OY4.4.1. If new viruses found by PREDICT, develop new sero assay and re-test samples
OY4.4.2.-OY5.4.2 Confirm additional test results and co-analyze molecular and sero data

Task 5. Develop serological and molecular virology study of farm workers, livestock, and wildlife around farms. (Y1-OY5) Grantee shall conduct a serological and molecular virology survey of farm workers and animals living on or around 2 large-scale farms (>5000 ruminants and/or pigs) and 2 small-scale farms (500-1000 ruminants and/or pigs) in Peninsular Malaysia to detect exposure to and presence of henipa- or filoviruses. Grantee shall work with DWNP to sample bats, macaques and dogs proximal to farms; and with MoH to conduct qualitative research and collect blood samples from farm workers to screen for henipa- and filovirus antibodies. Sample collection from animals and humans will also include two duplicate nasal or oropharyngeal swabs, fecal samples (animals only), and urine samples (animals only) for PCR analysis, utilizing a pan-henipavirus and panfilovirus assay developed under the PREDICT project. Grantee will work with UPM to sample and test livestock. In Y1 grantee will select appropriately sized farms. Grantee shall also locate bat caves or roosts proximal to each farm, meet farm owners, and characterize the livestock. Grantee shall apply for all necessary IRB and IACUC approvals. Grantee may commence sampling in Y2, pending approvals, and conduct a follow-up study in OY4 and OY5 (if funded). The grantee shall:

1.5.1 Meet with GoM partners to develop study;
1.5.2 Apply for ethical approvals and permits.
1.5.3. Conduct scoping visits to farms, characterize livestock and local wildlife species.
2.5.1-3.5.1 Collect wildlife, livestock, and human samples
2.5.2-3.5.2 Conduct questionnaires with farm workers
2.5.3-3.5.3 Screen samples using Luminex-based assay and PCR; confirm results
2.5.4-3.5.4 Enter data into database and analyze results
OY4.5.1-5.5.1 Repeat human, wildlife and livestock sampling at each farm
OY4.5.2-OY5.5.2 Test samples, enter results into database; analyze complete dataset
OY5.5.3 prepare manuscript based on (Y1-OY5) study

Task 6. Disseminate reports to relevant stakeholders (Y1-OY5). Grantee shall synthesize all data collected through the projects described above as well as capacity building activities in Malaysia. Scientific and general reports will be generated and provided to GoM partners and an annual report to DTRA. PhD or Masters' students will complete thesis and present at annual stakeholders meeting in KL or at scientific meeting in Malaysia. Grantee shall meet with GoM partners and SAG in Kuala Lumpur annually, according to schedule. Grantee shall present findings at scientific meetings (e.g. ASTM, ASM Biodefense, IMED, EcoHealth) to present findings according to the schedule.

1.6.1-OY5.6.1 submit progress reports to DTRA.
1.6.2-OY5.6.2 Complete annual report to local stakeholders.
1.6.3-OY5.6.3 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.6.4-OY5.6.4 Conduct annual stakeholder meetings.
3.6.5. Prepare comprehensive project report for GoM

3.6.7, OY5.6.7 UM Graduate students present thesis to committee and prepare publication in peer reviewed journal

3.6.6-OY5.6.6 Prepare and submit publications to disseminate study findings.

Project Timeline

Task	Y1	Y2	Y3	OY4	OY5
1. Enhance capacity in Malaysia for serological surveillance for all henipaviruses and filoviruses					
1.1. Transfer BioRad Bio-Plex 200 in NPHL, DWNP, and UPM labs					
1.2 Transfer serological reagents to NPHL, DWNP, UPM, and UM labs					
1.3 Training staff at partner labs					
1.4 Identify graduate students at UM and UPM					
1.5 Convene Science Advisory Group					
1.6 Develop database for serology results and sample metadata					
1.7 Training in pseudovirus development at USU					
2. Develop & validate henipavirus and filovirus reagents.					
2.1 Produce specific henipavirus and filovirus proteins					
2.2 Produce and test monoclonal antibodies against new proteins					
2.3 Transfer henipa and filo N protein assays to partner labs					
2.4. develop/validate proteins and mAbs for novel henipa- & filoviruses					
3.Screen archived wildlife and Orang Asli sera					
3.1 Identify archived wildlife and human sera at NPHL and DWNP					
3.2 Screen sera using Luminex-based platform					
3.3 Confirm positive sera with additional testing					
3.4 Enter results in database / analyze					
4. Sero-survey of Orang Asli and animals					
4.1 apply for IRB/IACUC approval					
4.2 Collect & test serum samples from Orang Asli + animals					
4.3 Enter results into database					
4.4 Confirm positive sera with additional testing					
4.5 Conduct follow-up study of Orang Asli and animals					
4.6 Analyze data					
5. Serological study of farm workers, livestock, and wildlife on farms	■	■	■	■	■
5.1 Apply for necessary permits and ethical approval	■	■			
5.2 scoping visits to potential study farms; select farms	■				
5.3 sample farm workers, livestock, and wildlife on farms		■	■		
5.4 follow-up study of farm workers, wildlife and livestock (4 farms)				■	■
5.5 Enter results into database / analyse results		■	■	■	■
6. Disseminate reports to relevant stakeholders					
6.1 annual report toDTRA					
6.2 annual report to government of Malaysia partners					
6.3 attend DTRA annual technical review					
6.4 partner meeting in Malaysia					
6.5 present results at scientific conference (e.g. ASTMH, IMED, ASM)					
6.6 prepare manuscripts for publication in peer-reviewed journal					

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00005	11-Apr-2019	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
	X	10B. DATED (SEE ITEM 13) 14-Apr-2017
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

X B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: bryantl191041

Change Task 5 in the SOW.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
		(b)(6) CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6)
(Signature of person authorized to sign)		(Signature of Contracting Officer)

16C. DATE SIGNED: 11-Apr-2019

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

The Table of Contents has changed from:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	8	01-MAY-2016
Exhibit B	DTRA Terms and Conditions	18	06-APR-2018

to:

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	8	11-APR-2019
Exhibit B	DTRA Terms and Conditions	18	06-APR-2018

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00006	23-Mar-2020	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
	X	10B. DATED (SEE ITEM 13) 14-Apr-2017
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
DTRA Terms and Conditions for Grants Awards, Section 5

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: rodgrigt20950

The purpose of this modification is to:

1. Combine the scope and value from Option CLINs 0002 and 0003 into base CLIN 0001.
2. Extend the POP of CLIN 0001 from 4/30/20 to 4/30/22 at no additional cost to the Government.
3. Update the Grant POC.
4. Update the grant funding profile and invoice schedule.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
	(b)(6) / CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)

15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	23-Mar-2020

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $1,565,534.00 from $2,550,132.00 to $4,115,666.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0001

The estimated/max cost has increased by $1,565,534.00 from $2,550,132.00 to $4,115,666.00.
The total cost of this line item has increased by $1,565,534.00 from $2,550,132.00 to $4,115,666.00.

CLIN 0002

The CLIN extended description has changed from:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 6 April 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0002 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

.

The estimated/max cost has decreased by $800,436.00 from $800,436.00 to $0.00.
The total cost of this line item has decreased by $800,436.00 from $800,436.00 to $0.00.

CLIN 0003

The CLIN extended description has changed from:

Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia.In accordance with the following attachments: SOW at Exhibit A and DTRA Terms and Conditions for Grant Awards dated 6 April 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0003 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

.

The estimated/max cost has decreased by $765,098.00 from $765,098.00 to $0.00.
The total cost of this line item has decreased by $765,098.00 from $765,098.00 to $0.00.

SUBCLIN 000106 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000106					$0.00
	Funding in support of CLIN 0001 COST				
				ESTIMATED COST	
	ACRN AF CIN: HDTRA10342010001				$1,565,534.00

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000106:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2017 TO 30-APR-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-BT (b)(6) 8275 JOHN J. KINGMAN RD #6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2017 TO 30-APR-2022	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-BT (b)(6) 8275 JOHN J. KINGMAN RD #6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $1,565,534.00 from $2,550,132.00 to $4,115,666.00.

SUBCLIN 000106:
Funding on SUBCLIN 000106 is initiated as follows:

ACRN: AF

CIN: HDTRA10342010001

Acctng Data: 044315 097 0134 000 N 20202022 D 3400 0901515BR_KD_BP_TB_20 2022_0134_3400_SCNCT DTRA 410

Increase: $1,565,534.00

Total: $1,565,534.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name (b)(6)
Defense Threat Reduction Agency/J4CO
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. Grantee Business Office:
Name: Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. Jonathan H Epstein
Title: Associate Vice President, Conservation
Phone: (212) 380-4467
E-mail: epstein@ecohealthalliance.org

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:

The amount of $4,115,666.00 is obligated for work to be performed during the period beginning with grant award and continuing through April 30th, 2022.

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE:

INVOICE NO.	INVOICE DATE	PAYMENT
1	May 31, 2019	$61,999.75
2	June 30, 2019	$61,999.75
3	July 31, 2019	$61,999.75
4	August 31, 2019	$61,999.75
5	September 30, 2019	$61,999.75
6	October 31, 2019	$61,999.75
7	November 30, 2019	$61,999.75
8	December 31, 2019	$61,999.75
9	January 31, 2020	$61,999.75
10	February 28, 2020	$61,999.75
11	March 31, 2020	$61,999.75
12	April 30, 2020	$61,999.75
13	31-May-20	$65,231.66
14	30-Jun-20	$65,230.58
15	31-Jul-20	$65,230.58
16	31-Aug-20	$65,230.58
17	30-Sep-20	$65,230.58
18	31-Oct-20	$65,230.58
19	30-Nov-20	$65,230.58
20	31-Dec-20	$65,230.58
21	31-Jan-21	$65,230.58
22	28-Feb-21	$65,230.58
23	31-Mar-21	$65,230.58
24	30-Apr-21	$65,230.58
25	31-May-21	$65,230.58
26	30-Jun-21	$65,230.58
27	31-Jul-21	$65,230.58
28	31-Aug-21	$65,230.58
29	30-Sep-21	$65,230.58
30	31-Oct-21	$65,230.58
31	30-Nov-21	$65,230.58
32	31-Dec-21	$65,230.58
33	31-Jan-22	$65,230.58
34	28-Feb-22	$65,230.58
35	31-Mar-22	$65,230.58

36	30-Apr-22	$65,230.58

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
P00004	04-Apr-2019	J3CTB23032	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11710037
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 14-Apr-2017

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Grant Terms & Condtions for 10a. All other terms and condition remain unchanged

E. IMPORTANT: Contractor [X] is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: bryantl19954

The purpose of this modifiation is to Incrementally fund HDTRA1-17-1-0037 to EcoHealth Alliance grant "Serological Biosurveillance for Spillover of Henipavirusese and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia" in the amount of $743,997.00

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL: (b)(6); (b)(7)(C) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 04-Apr-2019

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000105 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000105					$0.00
	Incremental Funding COST Incremental Funding in the amount of 743,997.00				
				ESTIMATED COST	$0.00
	ACRN AE CIN: HDTRA17230320006				$743,997.00

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000105:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2017 TO 30-APR-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 01-MAY-2017 TO 30-APR-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-BT (b)(6) 8275 JOHN J. KINGMAN RD #6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0002 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2020 TO 30-APR-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2020 TO 30-APR-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-BT (b)(6) 8275 JOHN J. KINGMAN RD #6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0003 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 01-MAY-2021 TO 30-APR-2022	N/A	DEFENSE THREAT REDUCTION AGENCY/J3CTB (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 01-MAY-2021 TO 30-APR-2022	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-BT (b)(6) 8275 JOHN J. KINGMAN RD #6201 FORT BELVOIR VA 22060 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $743,997.00 from $1,806,135.00 to $2,550,132.00.

SUBCLIN 000105:
Funding on SUBCLIN 000105 is initiated as follows:

ACRN: AE

CIN: HDTRA17230320006

Acctng Data: 044315 097 0134 000 N 20192021 D 3400 0901515BR_KD_BP_TB_19 1921_0134_3400_SCNCT DTRA 410

Increase: $743,997.00

Total: $743,997.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/J4CO
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. Grantee Business Office:
Name: Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. Jonathan H Epstein
Title: Associate Vice President, Conservation
Phone: (212) 380-4467
E-mail: epstein@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6) DNM MA
Defense Threat Reduction Agency/PI-CTB
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:

The amount of $2,550,132.00 is obligated for work to be performed during the period beginning with grant award and continuing through April 30th, 2020.

We are currently incrementally funding CLIN 1 in the amount of $743,997.00.

CLIN 1 is now fully funded.

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE:

INVOICE NO.	INVOICE DATE	PAYMENT*
1	May 31, 2019	$61,999.75
2	June 30, 2019	$61,999.75
3	July 31, 2019	$61,999.75
4	August 31, 2019	$61,999.75
5	September 30, 2019	$61,999.75
6	October 31, 2019	$61,999.75
7	November 30, 2019	$61,999.75
8	December 31, 2019	$61,999.75
9	January 31, 2020	$61,999.75
10	February 28, 2020	$61,999.75
11	March 31, 2020	$61,999.75
12	April 30, 2020	$61,999.75

(End of Summary of Changes)

CHAPTER 5: CO TIME-HISTORIES MEASUREMENTS DURING DMMP PYROLYSIS AND OXIDATION IN SHOCK TUBE

5.1 Introduction

Montreal protocol in 1990s prohibited the use of halons as fire suppressants due to their damaging effect on ozone layer[1]. Since then phosphorous containing compounds such as dimethyl methyl phosphonate (DMMP) and tri-methyl phosphate (TMP) have been identified as replacements of halons in fire suppressants. When used in gas-phase as dopants, these organo-phosphorous compounds (OPCs) interfere with normal combustion reactions to effectively reduce flame speed of hydrogen and hydrocarbon fuels[2]. OPCs are also used as chemical warfare agents (CWA) for example Sarin, GB and VX. Structure of DMMP is similar to that of nerve agent Sarin, GB and hence used as simulant to study combustion behavior of the toxic nerve agent. The most effective ways to destroy chemical weapons is by thermal means, i.e. incineration in an enclosed reactor or by utilizing tailored explosives. It is important to understand combustion chemistry of these compounds to be able to accurate predict their performance as fire suppressants and CW simulants.

Most of the past studies on DMMP combustion have been focused on its influence as an additive in transformation, structure and propagation of hydrogen and hydrocarbon flames[2, 28, 30, 47, 66-68]. DMMP when used as additive, changes the concentration of the most reactive radicals (H, O and OH) in the flame thereby producing promoting or retarding effects. Due to large hydrocarbon moiety of DMMP, it has been found that at fuel lean conditions addition of DMMP increases the burning velocity[30]. While at stoichiometric and rich conditions, DMMP is known to be very effective in suppressing flames, about 4 to 6 times more effective than bromine – a common halon fire suppressant[2, 30]. Twarowski investigated the inhibition effect of phosphorous containing compounds (described by reactions R1-R5) by studying the

reactions of phosphine addition to water[69]. Smaller phosphorus species PO2, HOPO and HOPO2 formed because of DMMP breakdown provide an alternative pathway for recombination of H and O atoms thereby reducing their concentration in the reaction zone. These reactions are chain terminating reactions and play important role in driving the radicals to their equilibrium values[28, 30, 68]. However, in fuel lean conditions, large hydrocarbon moiety of DMMP causes concentration of H and OH radicals in flame to increase and hence there is little effect of the alternative radical combination pathway[30] responsible for producing the inhibition effects.

OH + PO2 + M = HOPO2 + M (R1)

H+HOPO2 = H2O +PO2 (R2)

H+PO2+M = HOPO +M (R3)

H+HOPO= H2+PO2 (R4)

HOPO+OH = PO2 + H2O (R5)

Werner and Cool[70] developed first kinetic model for the decomposition of DMMP in a hydrogen/oxygen flame. They created a 19 step mechanism which was based on Twarowski[69] mechanism for small phosphorus reactions, ab-initio estimates of thermochemistry calculation and experiments data obtained from laser-ionization mass spectrometry. Korobeinichev et al[47] added nine reactions and several intermediates to include 18 species and 41 reactions. The same group (Korobeinichev et al 2004[27] and Jayaweera et al 2005[28]) further updated the model with more accurate ab-initio thermochemistry estimation of small phosphorous species and reaction rate of one of the important inhibition reactions (R2). The model was validated using species concentration profiles and laminar burning velocities for phosphorous doped premixed propane/air flame at different equivalence ratios. More recently, Babushok et al[30] employed GriMech3.0[71] and Jayaweera et al[28] mechanism along with three additional

phosphorous reactions (R6 - R8) to describe DMMP combustion in lean propane flames. A more comprehensive model was independently developed by Glaude et al[72] in early 2000s for DMMP and tri-methyl phosphate (TMP) decomposition, that attempted to account for all possible DMMP reaction pathways with 41 phosphorus species and 202 phosphorus reactions.

PO+HCO = HPO+CO R6

PO2+HCO=HOPO+CO R7

$PO3+HCO=HOPO_2+CO$ R8

As understood from the literature review, kinetic mechanism development and validation for DMMP has been focused on premixed flames experiments to investigate the effects of DMMP doping in hydrocarbon (CH_4 and C_3H_8) and H_2 flames. Recently, Mathieu et al[73] measured ignition delay times of DMMP in shock tube. DMMP in O_2 and Ar mixtures (fuel lean conditions) and DMMP doped in H_2, CH_4 and C_2H_4 mixtures were investigated near 1.5 atm and T = 1055- 2010K. The experimental results were compared with model prediction using Babushok 2016[30] and Jayaweera 2005[28] mechanisms and the need for significant improvement in both the models was identified. The authors stressed the importance of more experiments data such as species time histories of intermediate products in further improvement and tuning of the kinetic models. Mechanism incorporating detailed chemistry which includes unimolecular decomposition of DMMP in pyrolytic condition along with radical interactions and reactions with O and OH at fuel lean conditions is critical to accurately predict its destruction process. In addition, it is necessary to validate the kinetic model using high fidelity experiments data acquired at a range of equivalence ratios and temperature conditions. Once an accurate method of simulant such as DMMP has been developed using theoretical and experimental techniques, the model can be extrapolated to predict combustion behavior of CW simulants.

In present work, we utilized laser absorption spectroscopy to measure intermediate CO concentration time histories behind reflected shock wave during pyrolysis and oxidation (lean, stoichiometric and rich conditions) of DMMP. Since CO is the major intermediate during DMMP combustion, these experiments data provide important kinetic target for model validation. Experiments results were compared with model prediction using Babushok[30] mechanism and a tentative kinetic model (based on AramcoMech2.0 and LLNL OPC incineration mechanism) which was recently developed by our group and validated for triethyl phosphate combustion[51]. Further analysis on the results of sensitivity analysis and reaction pathways of DMMP decomposition is provided and future work on DMMP kinetic model improvement is discussed.

5.2 Experimental methods

5.2.1 Fuel/oxidizer Mixture Preparation

Research grade DMMP (> 97% pure; Acros Organics) and gases (O_2, Ar > 99.999% purity; nexAir) were used to prepare the test gas mixtures. The mixtures were prepared monometrically and the method is similar to that described in our work on low vapor pressure compounds[51]. DMMP has a low vapor pressure of ~0.8 Torr at 25 °C[23] and tend to condense and adhere on the surface of the mixing tank and transfer lines. To prevent condensation, the mixing facility and transfer lines were heated to 100 °C. The inside surface of the stainless-steel mixing tank (volume ~ 0.33m3) is Teflon coated to make it chemically inert. The entire mixing system was well insulated to avoid cold spots that can allow fuel condensation. Before preparing the test mixture, the tank was evacuated to less 0.05Torr using a turbomolecular pump (Agilent model V301). Approx. 0.5ml of liquid DMMP was injected into the heated tank using a lure lock gas tight syringe. Partial pressures were measured with 100 Torr and 10,000 Torr full scale range baratrons (MKS Baratron E27D and 628D). A magnetically driven stirrer was used to ensure homogeneity of the mixtures. The mixtures were allowed to mix for at least 2 h prior to experiments.

At 100 °C, the vapor pressure of DMMP increases to ~50 Torr[23]. To minimize fuel condensation, the partial pressure of DMMP was kept less than 25% of its saturation vapor pressure at respective temperatures at all the times. To verify our mixture is homogenous, we measured absorbance of the test mixture at different pressures in shock tube using a CO_2 gas laser (Access laser) tuned at 1050.433cm^{-1}. DMMP has a strong and broad absorption feature centered near this wavelength[45]. The measured absorbance was plotted against concentration-pathlength 'burden' [mol/m^3 * m] as shown in Figure 5-1. The straight line shows that our mixture is homogenous, and slope of the line gives absorption cross section, [m^2/mol] of DMMP at and 80 °C (temperature, T1 of the shock tube) as calculated using Beer law (Eq. 1). Details of the laser diagnostics setup utilizing the CO_2 gas laser to measure OPC concentration is provided in our previous work[4, 51].

$$\alpha_\nu = -\ln\left(\frac{I}{I_o}\right)_\nu == n_i\sigma_i(\nu, T, P_{tot})L = \sigma_i(\nu, T, P_{tot})\frac{P_{tot}}{RT}\chi_i L \qquad (1)$$

In Eq. 1, α_ν is the absorbance at frequency ν, I and I_o are the measured intensities of laser power in test gas mixture and in vacuum respectively, n_i [mol/m^3] is the concentration of absorbing species 'i'; σ [m^2/mol] is the cross section, P_i [Pa] is the partial pressure of the absorbing species; L [m] is the length of the shock tube; R_u [J/mol-K] is the universal gas constant; T [K] is the temperature, X_i is the mole fraction of absorbing species and P_{tot} [Pa] is the total pressure of the mixture.

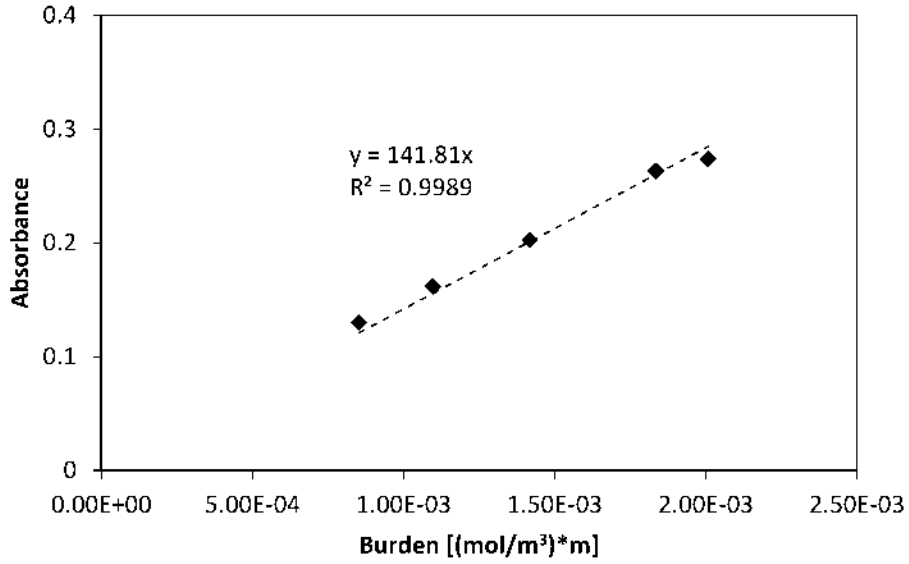


Figure 5-1: Plot of measured absorbance vs concentration-pathlength 'burden' of 0.1% DMMP/Ar mixture showing a linear trend

5.2.2 Shock tube experiments

DMMP pyrolysis and oxidation experiments were performed using high purity, stainless steel, and heated shock tube at University of Central Florida. The details of the shock tube can be found in our previous work[5]. The driven section of the shock tube was uniformly heated to 80 °C (pre-shock temperature T1) using custom made heating jackets supplied from Brisk Heat and PID temperature controllers. Ultra-high purity helium (99.999% pure) was used as a driver gas and polycarbonate diaphragms (0.127 mm thick), placed between the driven and the driver sections, upon bursting yielded pressures (P5) of ~1.7 atm behind the reflected shock wave. Incident shock velocities were measured using five piezoelectric pressure transducers (5 KHz frequency response) spaced along the last 1.4 m of the shock tube and connected to four time-interval counters (Agilent 53220A, 0.1 ns time resolution). The measured incident shock velocities were linearly extrapolated to obtain the reflected shock velocity at the end wall. Pressure and temperature behind reflected shock wave (P5 and T5) were calculated using the measured shock velocity

and pre-shock temperature and pressure (P1, T1) in normal-shock relations assuming vibrationally equilibrated gases behind both the incident and reflected shocks. Thermochemical data of DMMP for the calculation was taken from Neupane et. al. 2018[51]. Pressure, P5, was also monitored using Kistler 603B1 – a piezoelectric pressure transducer placed in the shock tube side wall at a distance of 2cm from the end-wall.

Before each experiment, the driven section was evacuated to an ultimate pressure of less than 5.0E-5 Torr using combination of roughing pumps (Agilent DS102) and a turbo molecular pump (Agilent model V301). A rotary vane pump (Agilent DS102) was used to rough the driver section of the shock tube. The shock tube was filled with P1 = 50-80 Torr of test mixture to obtain the desired temperature T5 ranging within 1200-1900 K. The shock tube configuration and use of driver inserts allowed to obtain a constant P5 behind the reflection shock region for test times of ~2.5 ms. Table 5-1 lists the experiments conditions for DMMP pyrolysis and oxidation carried out in the present work. Uncertainties in T5 and P5 were estimated to be less than 2.0% and 1.5 % respectively. Equivalence ratios (ϕ) for DMMP/O_2/Ar mixtures were determined assuming H_2O, CO_2 and $HOPO_2$ as products.

Table 5-1: Experiments conditions (Pressures and Temperatures) during pyrolysis and oxidation of DMMP

Pyrolysis		ϕ =0.23		ϕ =0.5		ϕ =1		ϕ =2	
P5 [atm]	T5 [K]	P5 [atm]	T5 [K]	P5 [atm]	T5 [K]	P5 [atm]	T5 [K]	P5 [atm]	T5 [K]
1.67	1449	1.66	1335	1.76	1352	1.63	1690	1.59	1686
1.67	1545	1.60	1389	1.80	1370	1.70	1535	1.65	1557
1.66	1619	1.67	1526	1.695	1502	1.88	1452	1.71	1419
				1.587	1681	1.88	1353	1.777	1366

5.2.3 Laser absorption spectroscopy to measure CO concentration

Intermediate CO concentration formed during pyrolysis and oxidation of DMMP were measured using a continuous wave distributed feedback quantum cascade laser (CW-DFB QCL) operating near 4.886 μm to probe the P(23) transition line of CO (Figure 5-2). A 50/50 beam splitter was used to split the laser light into two beams: reference (I_{ref}) and transmitted (I_{tr}). The reference beam was used to monitor laser power fluctuations during the experiments. Transmitted beam was directed through the test section via two sapphire windows. A narrow band pass filter was used at downstream of shock tube to filter out emissions from hot gasses. The beam was then collected in a thermoelectrically cooled MCT (HgCdTe) Vigo Systems PVI-2TE-5.0 photovoltaic detector using a focusing mirror.

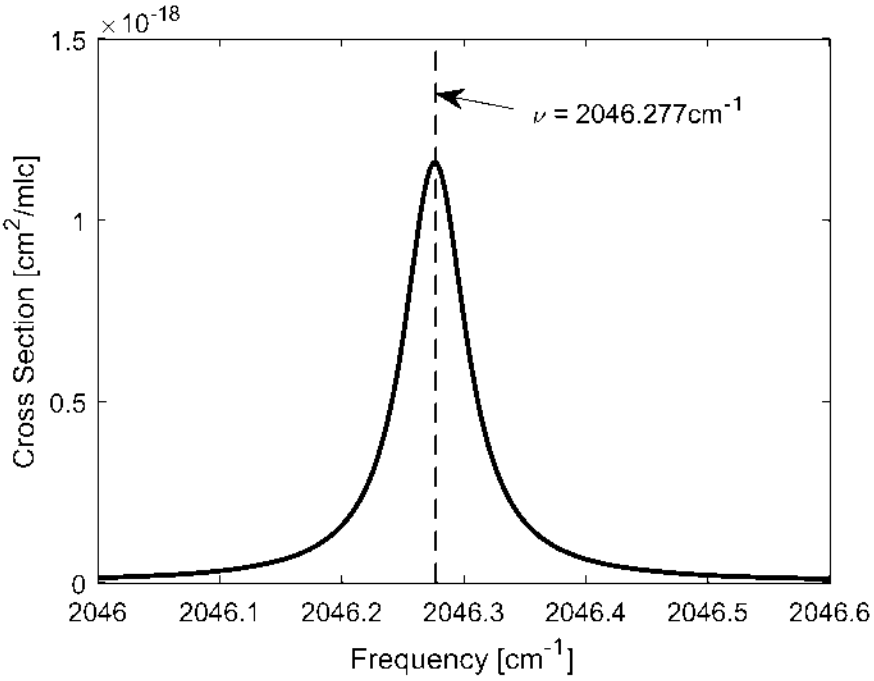


Figure 5-2: Absorption cross section of CO near 4.88μm and at 1500 K and 1.7 atm simulated using HITRAN database[39].

Bristol spectrometer was used to monitor frequency of laser beam during the experiment. Beer-Lambert law (Eq. 1) was used to calculate CO centration (X_i) from the measured absorbance time-histories. The CO cross section (σ [m^2/mol]) at T_5 and P_5 were modeled using spectroscopic parameters (line broadening and line strength) from HITRAN database[39] assuming self-broadening and fitting a Voight line shape profile. The CO cross sections at the chosen wavelength and within the temperature and pressure range of our interest were also measured in shock tube experiments performed with pure CO and Ar. The measured values agreed with HITRAN simulation results within ±5%.

Experimental pressure traces obtained during pyrolysis and oxidation of DMMP were almost constant (example

Figure 5-3) and hence constant pressure gas dynamic model was used in Chemkin-Pro for all simulations. Major combustion products formed during the process include hydrocarbons species such as CO, CO_2, CH_4, C_2H_4 and H_2O and small phosphorous species such as $HOPO_2$, HOPO, $CH3OPO_2$ and $CH3PO_2$. Within our experiment conditions (T= 1300 – 1700 K and P ≈ 1.7 atm), except for CO, other major combustion products do not have absorption feature near 4.9 μm, hence allowing for interference free measurement of CO concentration. The uncertainty in measured CO mole fraction was estimated to be 5.5% (due to combined uncertainty in spectroscopic parameters: P5, T5, path length and CO cross section) or ±50ppm (experimental uncertainty due to noise in the measured absorbance signal) whichever is greater.

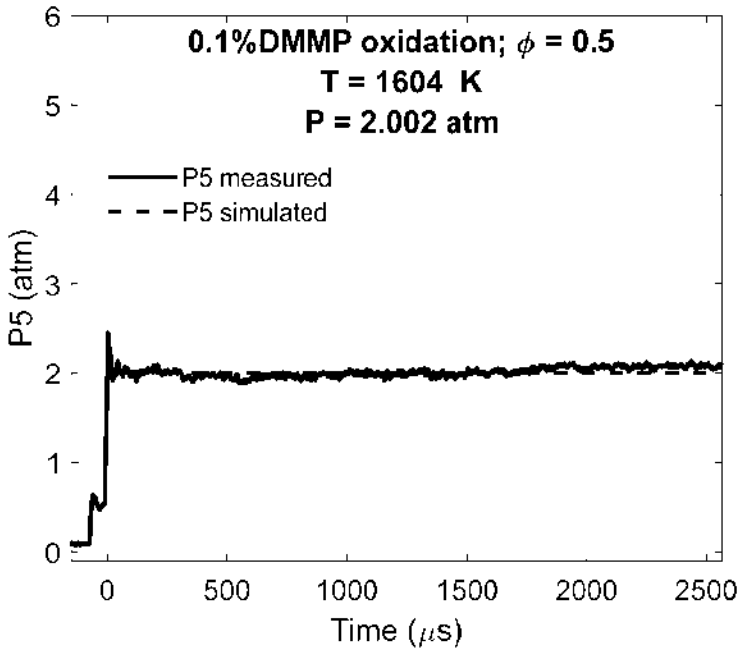


Figure 5-3: Measured pressure, P5 vs simulated pressure in Chemkin-Pro

5.3 Results and discussions

5.3.1 DMMP pyrolysis: CO concentration time-histories

The measured CO concentration time histories during 0.1% DMMP pyrolysis behind reflected shock wave at three temperatures: 1449 K, 1545 K and 1619 K are shown in Figure 5-4. Rate of CO production and the concentration of CO yield at the end of 2.5ms increased with increase in temperature. CO yield at the end of the test time at 2.5ms during pyrolysis of 0.1% DMMP are 0.035%, 0.055% and 0.087% at 1449, 1545 and 1619 K respectively. At all three temperatures, there is sharp increase of CO early on during the pyrolysis process after which the rate of production decreases for some time and then finally achieve a steady and slow rate of increase in CO concentration until the end of the test time at ~2.5ms.

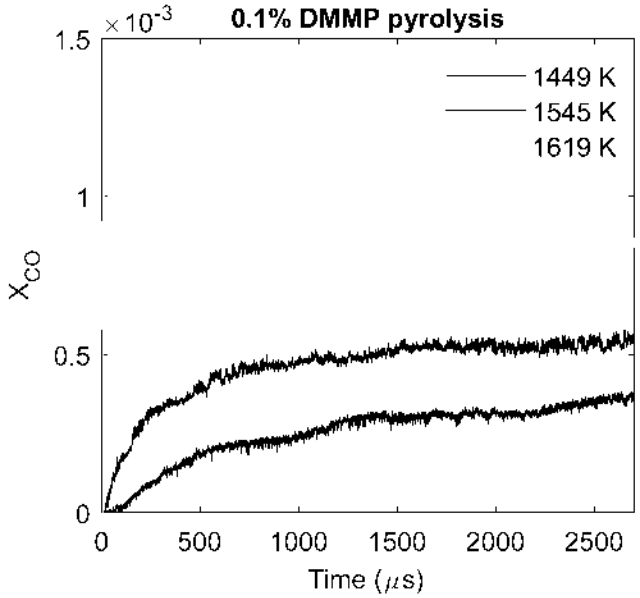
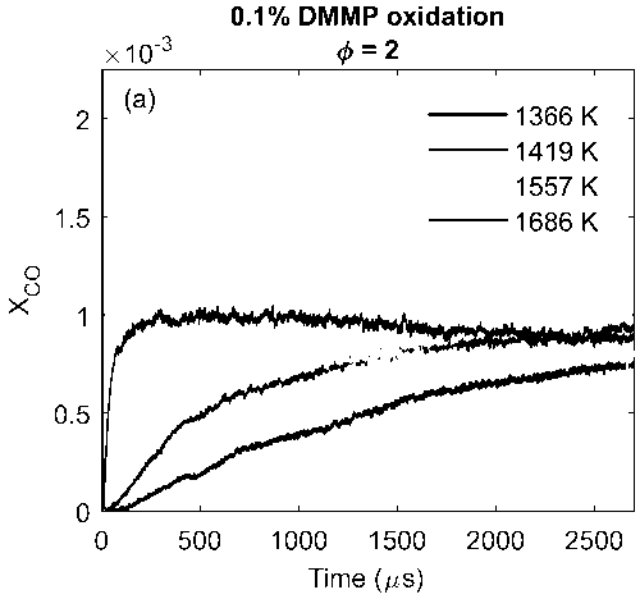
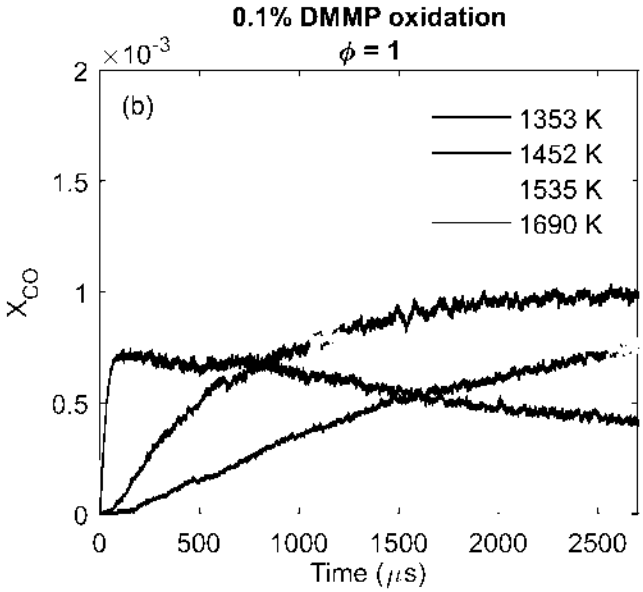


Figure 5-4: CO formed during pyrolysis of 0.1% DMMP at the three temperatures indicated in the figure. P ~ 1.7 atm.

5.3.2 DMMP oxidation: CO concentration time-histories

Plots of CO time-histories during DMMP oxidation at different temperatures and equivalence ratios are shown in Figure 5-5 (a – d). For fuel rich (Φ=2, Figure 5-5 (a)) DMMP oxidation, at lower temperatures (1366 K and 1419 K), CO is still being produced at the end of the shock tube test-time (2.5ms). The rate of formation of CO at these temperatures is higher in the beginning of the oxidation process and then decreases to slower formation rate after ~500μs. Similar trend is seen at stoichiometric(Φ=1) and lean conditions (Φ=0.5, 0.25) and at lower temperatures (Figure 5-5 (b-d)). At higher temperatures (Figure 5-5 (a), 1686 K and 1557 K) CO forms quickly and reaches a peak value within 500μs, after which it slightly decreases as CO starts to get consumed. Again, similar trend is observed at higher temperatures in stoichiometric and lean oxidation of DMMP (Figure 5-5 (b-d)). However, at similar temperatures, the rate of consumption of CO, after reaching the peak value, is faster as the mixture becomes leaner (decreasing equivalence ratio). For example, see 1686 K (phi =2) and 1690 K (phi=1) in Figure 5-5 (a) and (b) respectively. This can be attributed to higher concentration of O_2 in the mixture which allows for faster conversion of CO into CO_2.




0.1% DMMP oxidation
ϕ = 1
$\times 10^{-3}$
(b)
1353 K
1452 K
1535 K
1690 K
X_{CO}
Time (μs)
0
0.5
1
1.5
2
0
500
1000
1500
2000
2500

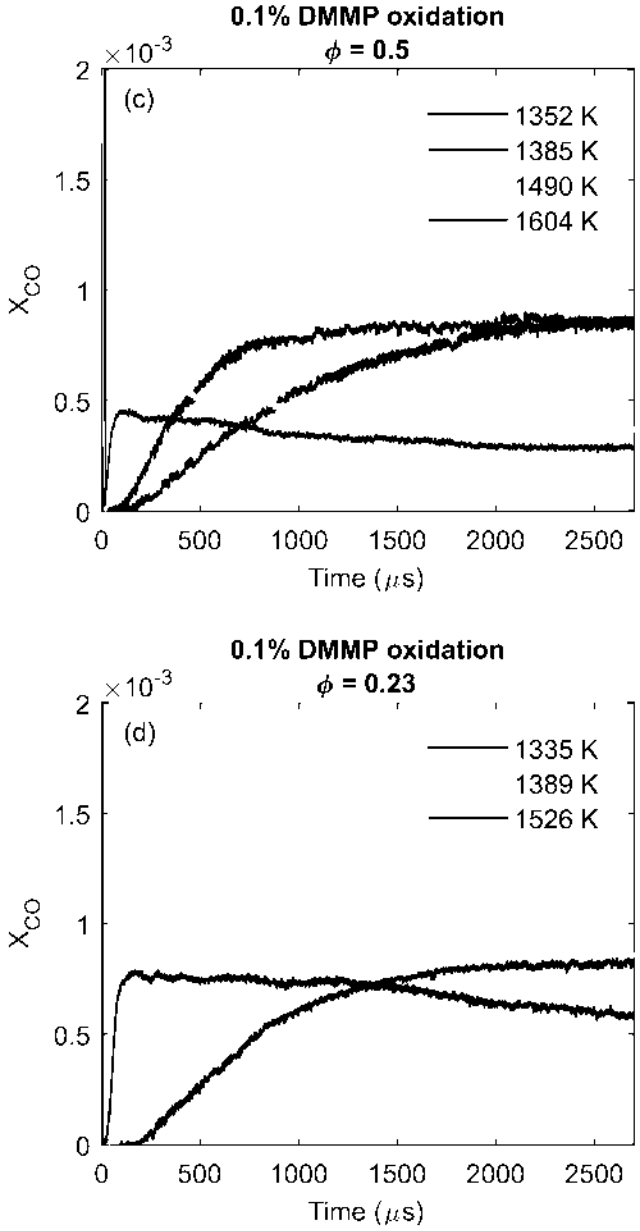


Figure 5-5: CO formed during oxidation of 0.1% DMMP at different equivalence ratios.

5.3.3 Comparison with model predictions

A 0-D closed homogeneous reactor with constant pressure assumption in ANSYS Chemkin Pro software was used to simulate experimental conditions and predicted CO yield during pyrolysis and oxidation of

DMMP were compared with experiments results. 'Babushok 2016' 'Aramco2.0+LLNL' mechanisms were used for the kinetic calculations. 'Aramco2.0+LLNL' mechanism was put together in Chapter 2 and also published elsewhere[51] on combustion of tri-ethyl phosphate which is also an organo-phosphorus compound. The model is based on AramcoMech2.0 and LLNL OPC incineration mechanism for phosphorous chemistry. The model also consists of updated thermochemical data of 48 phosphorous containing species (including DMMP and its derivatives) which was based on recently proposed group values of phosphorous species[41] and theoretical calculations. DMMP and smaller phosphorous reactions in this mechanism are same as LLNL incineration mechanism. Babushok 2016 mechanism[30] is based on GriMech3.0 and Jayaweera et al[28] mechanism along with three additional phosphorous reactions (R6-R8) and was validated using flame speed data of DMMP combustion in lean propane flames.

Figure 5-6 to Figure 5-10 show the comparison of experiment and simulation results using both the kinetic models. For high temperature (1619 K) pyrolysis case (Figure 5-6c), both the models provide good prediction of CO yield. While at low temperature (1449 K) pyrolysis condition (Figure 5-6a) both the models are underpredicting the initial CO formation rate. For oxidation (Figs 5-7 to 5-10), both the models fail to predict CO yield satisfactorily. In Figures 5-7(a-b), lower temperature (1366K and 1419K) fuel rich oxidation of DMMP, the Aramco2.0+LLNL model provides fair agreement with the experiment data while the CO yield predicted by Babushok mechanism is significantly lower. On the other hand, at 1452 K and phi=1 (Figure 5-8b), Babushok mechanism provides better agreement with experiments CO yield. At higher temperature cases (T>1500K) for lean, stoichiometric and rich conditions, both the models are over predicting CO yield as compared to experiment results with Babushok 2016 mechanism being closer to the experiments. From these results of DMMP oxidation, it can be concluded that Babushok mechanism is likely to underpredict CO yield at lower temperatures (1350-1420 K) and over predict at higher temperature (>1502 K). Except for low temperature rich conditions (Figure 5-7: 1366K and 1419K), Aramco2.0+LLNL mechanism is over predicting CO yield significantly in all oxidation cases.

Note that Babushok mechanism has additional three reactions involving CO and smaller phosphorous species (R6-R8) that are not included in LLNL's phosphorous chemistry. These reactions were added to 'Aracmco+LLNL' mechanism, however they did not produce any significant change in the predicted CO yield. It is also clear from the results that both the mechanisms do not sufficiently describe combustion process of DMMP. The reaction rates of major reactions in DMMP breakdown pathways are same in both the mechanisms, so the differences in CO prediction from the two mechanisms can be attributed to a different hydrocarbon chemistry and thermochemistry of phosphorous species.

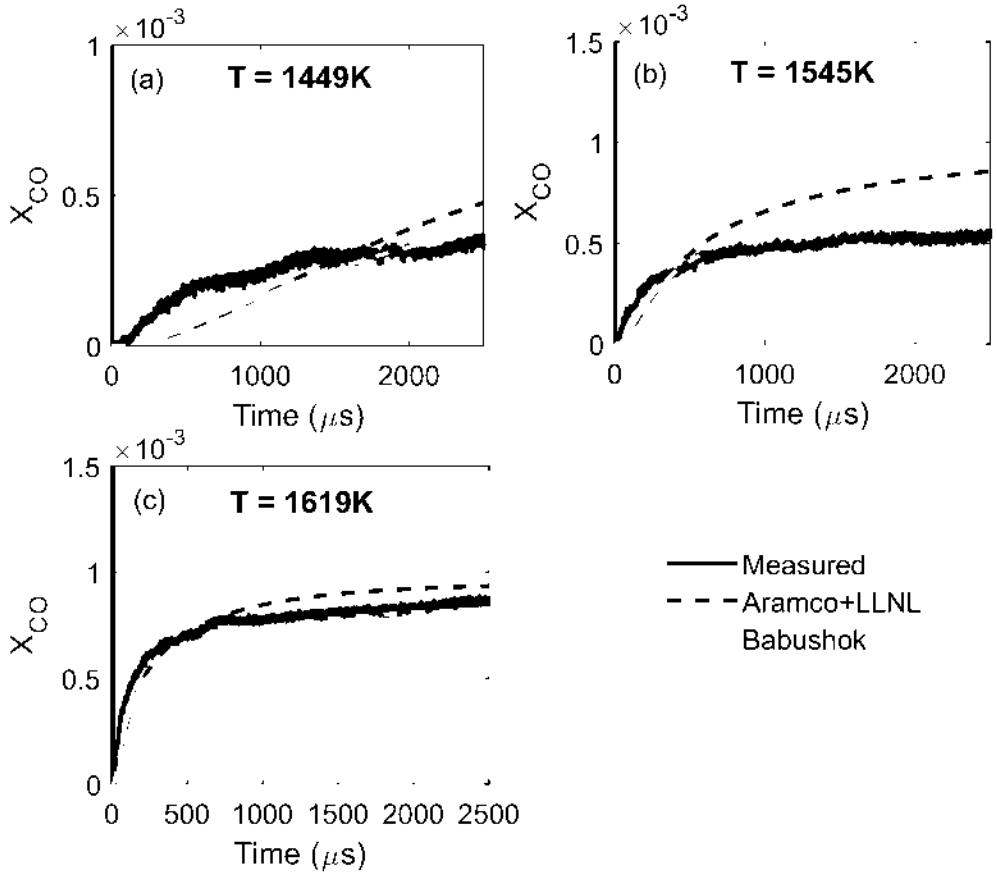


Figure 5-6: Experiments vs. models: CO yield during pyrolysis of 0.1% DMMP pyrolysis

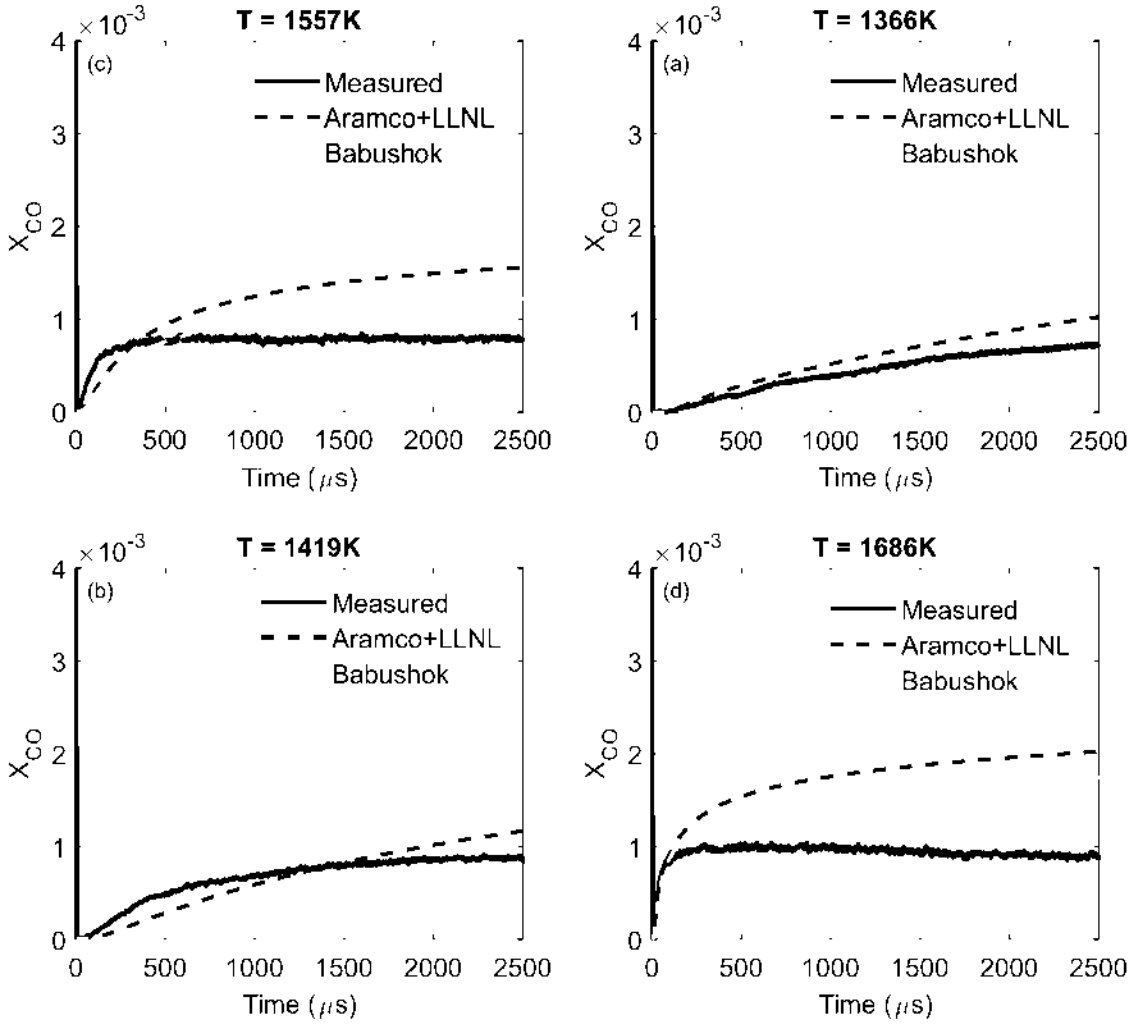


Figure 5-7: Experiments vs. models: CO yield during oxidation of DMMP ϕ=2

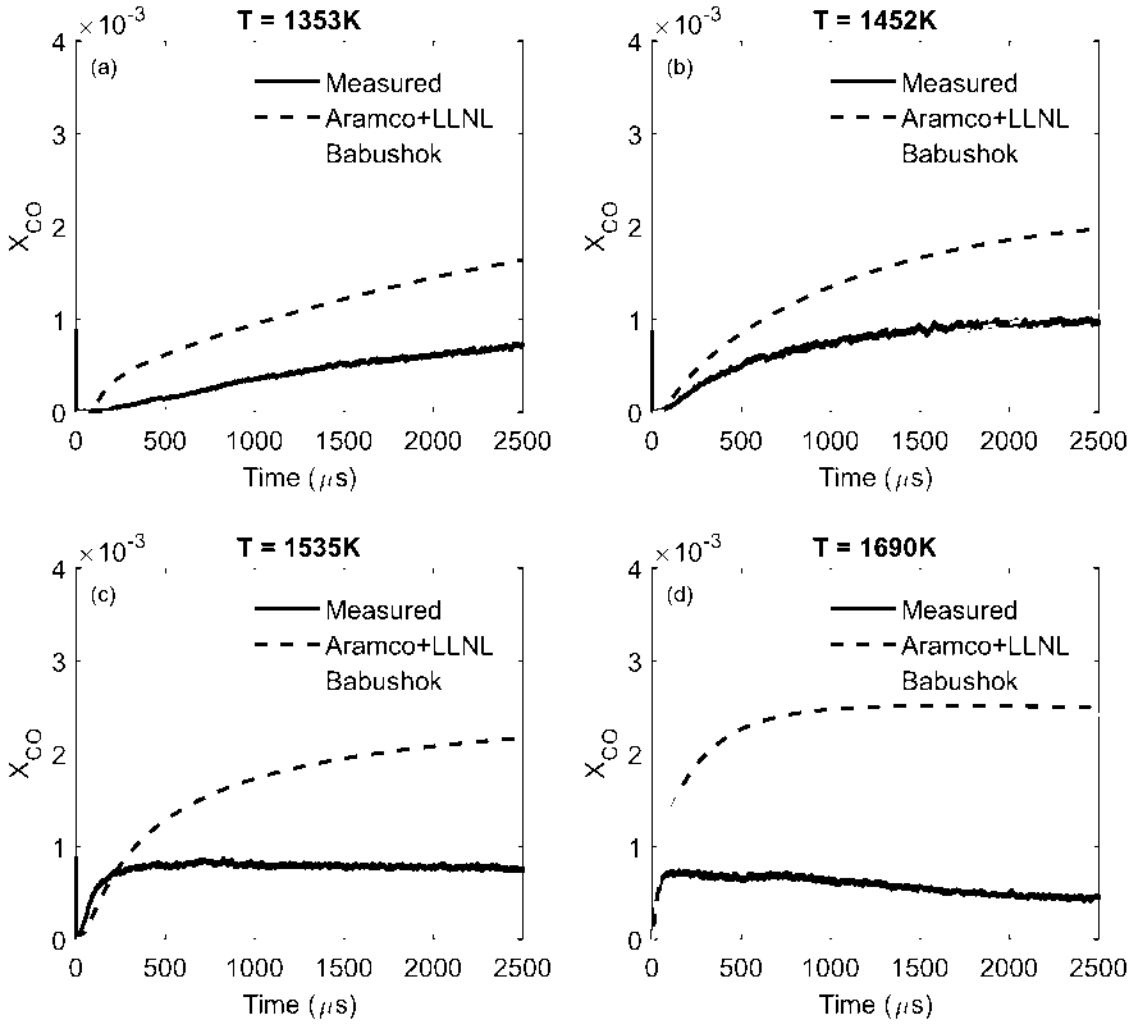


Figure 5-8: Experiments vs. models: CO yield during oxidation of DMMP ϕ=1

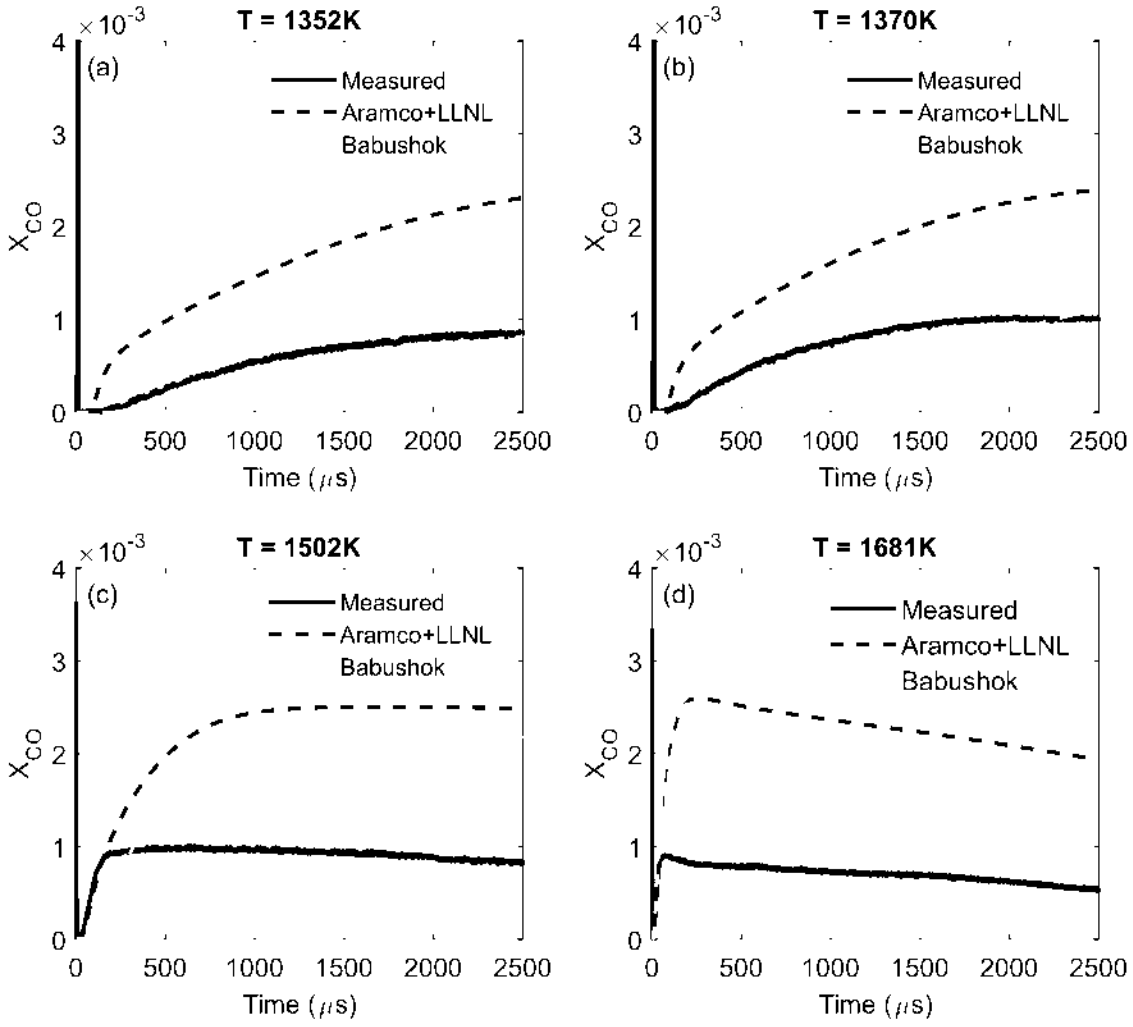


Figure 5-9: Experiments vs. models: CO yield during oxidation of DMMP ϕ=0.5

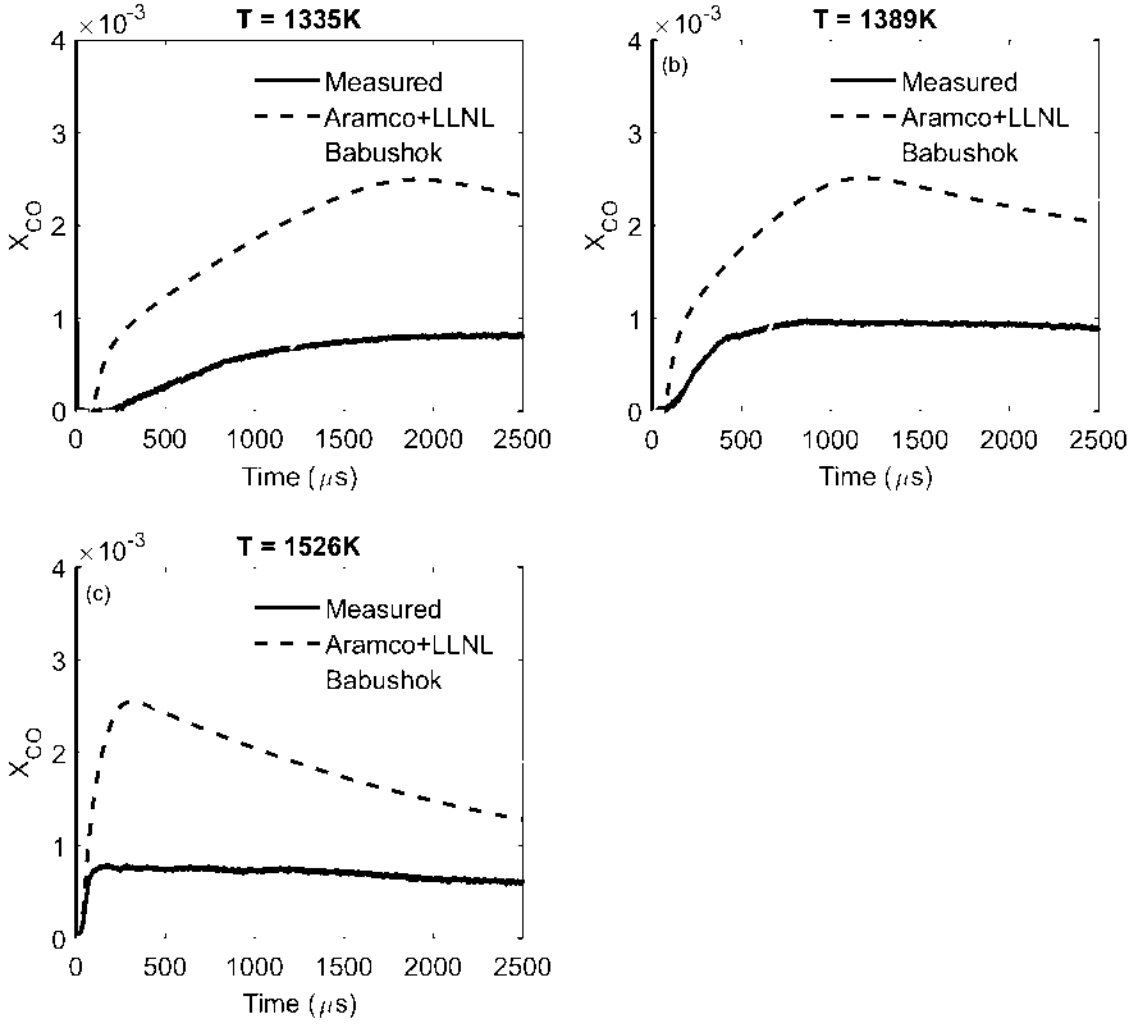


Figure 5-10: Experiments vs. models: CO yield during oxidation of DMMP ϕ=0.23

5.3.4 Sensitivity and reaction path analysis:

To further understand the performance of kinetic model at different temperatures and equivalence ratios, a detailed sensitivity and rate of production (ROP) analysis were carried out, the results of which are discussed in this section. 'Aracmco+LLNL' mechanism and ANSYS Chemkin-Pro 0-D closed homogenous constant pressure reactor were used for the analysis. Top 10 sensitive reactions contributing to CO

production/consumption during the first 500μs of oxidation and pyrolysis of DMMP were identified. Sensitivity coefficient (S) for i^{th} reaction rate (k_i) for a species is defined in Equation 2.

$$S\left(X_{species}, k_i, t\right) = \left(\frac{d\, X_{species}(t)}{d\, k_i}\right)\left(\frac{k_i}{X_{species}(t)}\right) \qquad \text{Eq. 2}$$

Important phosphorous reactions from the results of sensitivity analysis of 0.1% DMMP pyrolysis at 1405 K (low temperature case) and 1619 K (high temperature case) are shown in Figure 5-11. Solid and dashed lines represent high and low temperature cases, respectively. In both the cases, the most sensitive phosphorous reaction is R86. This is a bond fission reaction in which CH_3 group attached directly to the P atom of DMMP breaks to form CH_3 and $PO[OMe]_2$ radicals as products. This is the major pathway via which DMMP decomposition takes place during DMMP pyrolysis as shown in DMMP ROP analysis Figure 5-12. Note that sensitivity of this reaction to CO formation at high temperature (1619K) quickly peaks and then decreases to attain a negative sensitivity after 200μs of the pyrolysis reaction. Negative sensitivity coefficient means CO yield decreases with increase in reaction rate of the reaction. Reactions, R103 and R104 are two pathways of decomposition of PO[OME]2 radical (formed via R86) and have equal but opposite sensitivity coefficients to CO concentration yield. Besides these reactions, reaction R81 was also among the top 10sensitive reactions, however its sensitivity coefficient quickly peaks and then decreases to zero (not shown in the plot) within 1μs. Changing the rate of this reaction by up-to one order of magnitude did not affect the predicted CO yield. At 1619K, an additional phosphorous reaction R107 (not shown in the figure) was also among the top 10 sensitive reactions. From these results, it can be concluded that more accurate kinetic parameters of R86 optimized for wide range of temperature can significantly contribute to model improvement in DMMP pyrolysis case.

POME[OME]2=CH2O+P[OH]ME[OME] R81

POME[OME][OCH2]+H=POME[OME]2 R83

POME[OME]2=PO[OME]2+CH3	R86
PO[OME]2=CH3OPO2+CH3	R103
PO[OME]2=CH3OPO+CH3O	R104
POME[OME]OCH2=POME[OME]+CH2O	R107

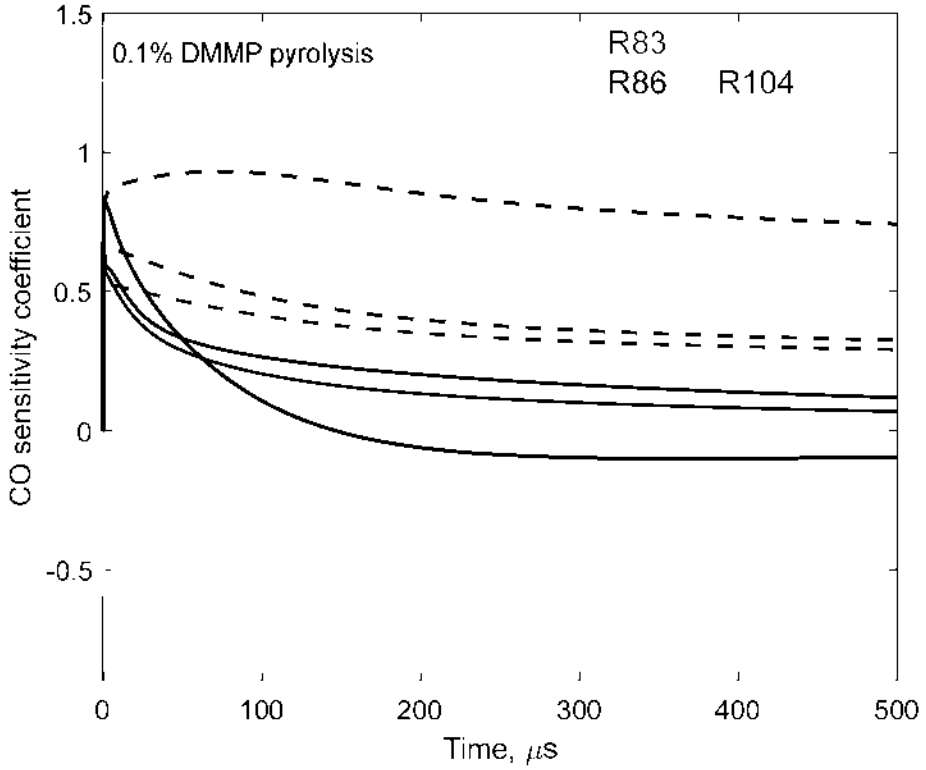


Figure 5-11: Sensitivity analysis on CO concentration yield during 0.1%DMMP pyrolysis 1405K (dashed lines) and 1619K (solid lines) showing top phosphorous reactions

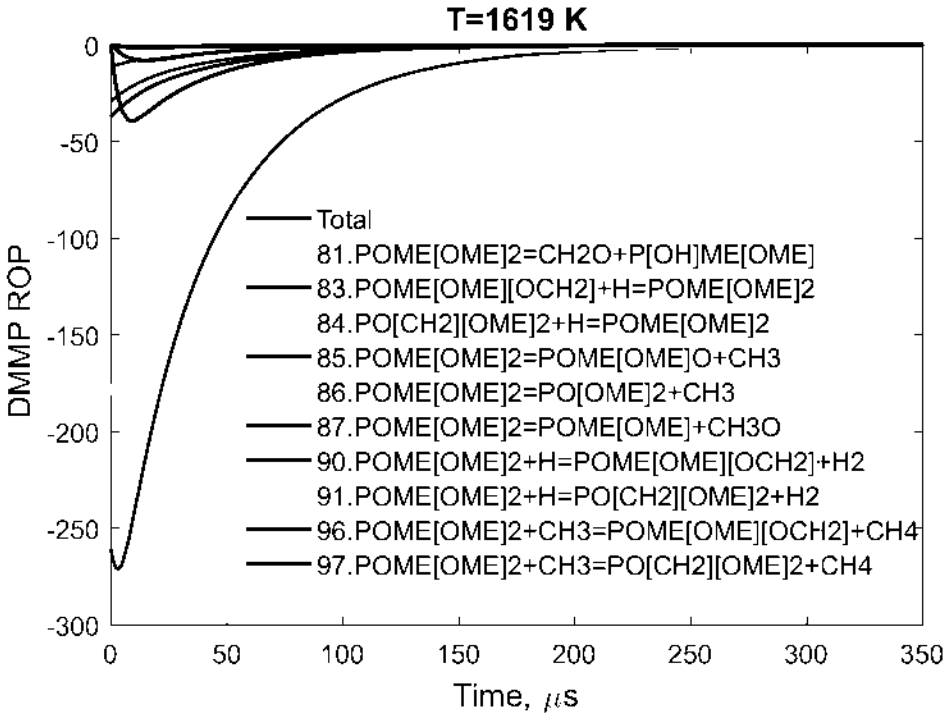


Figure 5-12: ROP analysis on DMMP during its pyrolysis at 1619 K

Similarly, sensitivity analysis was carried out for CO yield during DMMP oxidation at Φ=0.5 and T=1352 K (low temperature case) and 1604K (high temperature case) and the results are shown in Figure 5-13. At low temperature (solid lines), H-abstractions reactions of DMMP by O and OH radicals, R92 and R94, show higher sensitivities to CO yield whereas for the high temperature oxidation case, these reactions were not among the top 10 sensitive reactions. Reaction R92 showed maximum sensitivity coefficient for low the temperature oxidation case. Other reactions that were found to be important in oxidation of DMMP are same as pyrolysis and include reactions R86, R103 and R104. Two additional reactions involving CH3OPO (R38 and R183) were also among the important reactions for both low and high temperature DMMP oxidation. Radical recombination reaction, R83 was sensitive only in the high temperature oxidation case.

POME[OME]2+O=POME[OME][OCH2]+OH R92

POME[OME]2+O=POME[OME][OCH2]+OH	R94
CH3+PO2=CH3OPO	R38
CH3OPO2+O=CH3OPO+O2	R183
POME[OME][OCH2]+H=POME[OME]2	R83

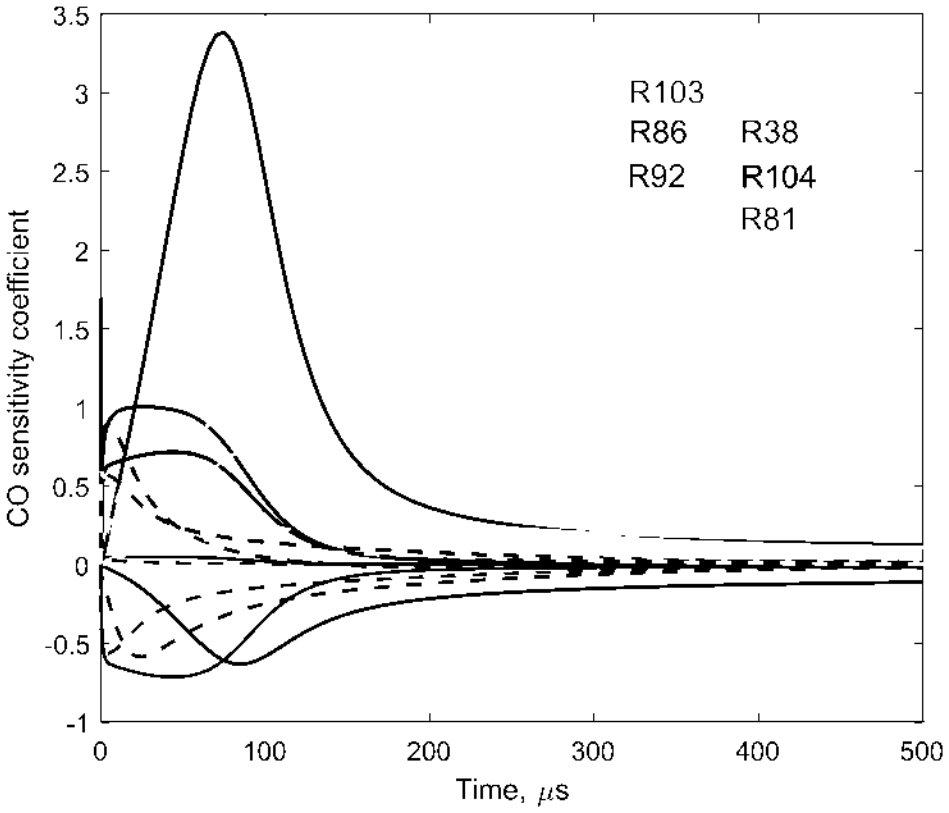


Figure 5-13: Sensitivity analysis on CO concentration yield during 0.1%DMMP oxidation at Φ=0.5 and 1352K (solid lines) and 1604K (dashed lines) showing top phosphorous reactions

For high temperature oxidation case, initial rate of formation of CO is agreeing well with the experiments (Figures 5-7d, 5-8c-d, 5-9c-d, 5-10c). However, the models proceed to overpredict CO yield by up to a

factor of 2. Note that sensitivity result in Figure 5-13 shows the top reaction in the first 500μs after the start of oxidation reaction. The sensitivity coefficient of the identified reactions peak and then decreases within the first 200μs and after which CO yield has very low sensitivities to these reactions. Hence additional sensitivity analysis for CO yield during DMMP oxidation at 1602 K was carried and to understand reactions that contribute to CO formation/consumption during the latter stage of DMMP oxidation (after 1.5us) and the top 10 reactions are shown in Figure 5-14.

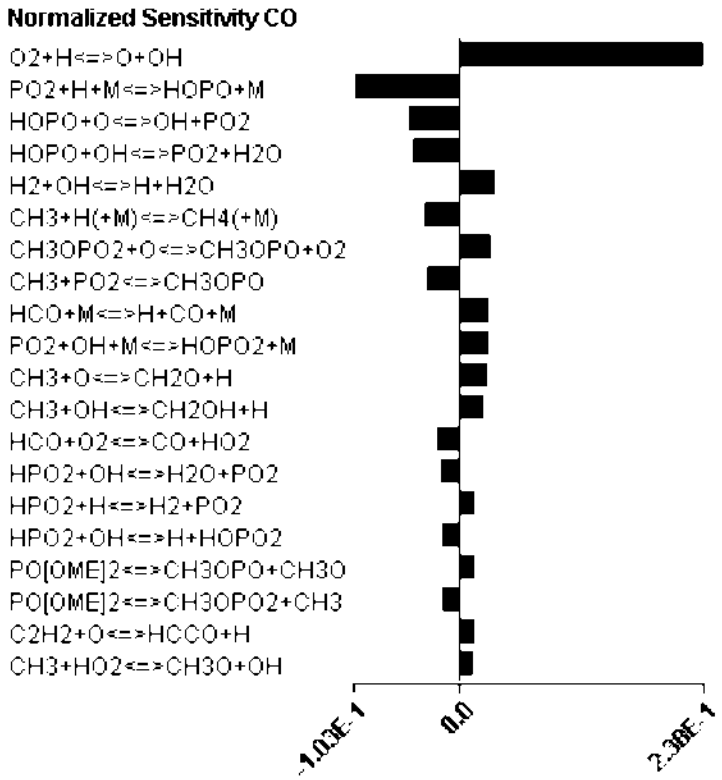


Figure 5-14: Sensitivity analysis on CO concentration yield during 0.1%DMMP oxidation at Φ=0.5 at 1.5ms

During the first 500 μs, the most sensitive reactions are the initial DMMP decomposition reactions as seen from Figure 5-13. The sensitivity analysis result (Figure 5-14) at 1.5ms after the oxidation reaction, this is

when 100% of DMMP has been consumed, indicate smaller phosphorous reactions R3, R5 and R9 as the most sensitive ones.

PO2+H+M = HOPO+M (R9)

Rates of these reactions were increased by an order of magnitude to understand their effect on CO yield. This made a significant decrease in CO yield during oxidation, while their effect of the CO yield during pyrolysis was negligible. Proper optimization of reaction rates of these reactions is suggested for future kinetics study of DMMP oxidation. In addition, further investigation into missing reactions involving hydrocarbon and smaller phosphorous species is also recommended. In addition, for low temperature oxidation cases, H-abstraction reactions of DMMP by O and OH (R92 and R94) should be investigated.

5.4 Conclusions

Concentration time histories measurements of CO were performed for DMMP pyrolysis and oxidation at temperatures of 1300-1700K, pressures of 1.5-2.0 atm, and Φ=0.25, 0.5,1 and 2. Comparisons were made with two kinetic models: Babushok 2016 and Aramco2.0+LLNL model. Babushok mechanism is based on Twarowski[69] and Jayaweera et al[28] phosphorous chemistry and GriMech2.0[71]. Aramco2.0+LLNL mechanism has hydrocarbon chemistry from AramcoMech2.0 and phosphorous chemistry from LLNL's OPC incineration mechanism along with recently updated thermochemical data of phosphorous species. Both models exhibited fair agreement for high temperature pyrolysis (1619 K) case. For low temperature pyrolysis (1445 K), both the models underpredicted rate of CO production. For oxidation, performance of both the models were not satisfactory in terms of CO prediction. At high temperatures (>1500 K), models overpredicted CO yield significantly. At low temperatures (1330 K – 1420 K), Babushok model underpredicted CO yield and formation rates while LLNL+Aramco model exhibited fair agreement at rich conditions. Sensitivity analysis indicates that for low temperature oxidation (1300-1450 K), accurate rate

parameter of H-abstraction reactions of DMMP by O and OH radicals (R92 and R94) are needed for accurate prediction of CO yield. For higher temperature oxidation cases, reaction of smaller phosphorous species PO_2 and HOPO with H and OH radicals should be investigated along with addition of reaction pathways involving reactions of hydrocarbons with phosphorous species. Further experiments targeting phosphorous species such as PO_2 and HOPO will provide important validation target for DMMP oxidation mechanism. Lower temperature prediction of CO concentration during DMMP pyrolysis could be improved by high level theoretical calculation or direct experimental measurement of rate of reaction R86 which involves bond fission of DMMP to form $PO[OME]_2$ and CH_3 radicals.

CHAPTER 6: PYROLYSIS, OXIDATION AND DOPED STUDIES OF DIMP IN A SHOCK TUBE

6.1 Introduction

Due to the high toxicity of CW agents, laboratory experiments are carried out using OPC surrogates [74-77], whose chemical structure and properties are similar to those of the CW agents. Diisopropyl methylphosphonate (DIMP) is one of the Sarin surrogates that is considered as the closest one to reproduce the predicted rate of Sarin decomposition [78]. Molecular structures of DIMP and Sarin are shown in Fig. 1. DIMP contains two $OCH(CH_3)_2$ (isopropoxy) groups attached to the central P atom whereas in Sarin, one of the isopropoxy groups is replaced by a F atom.

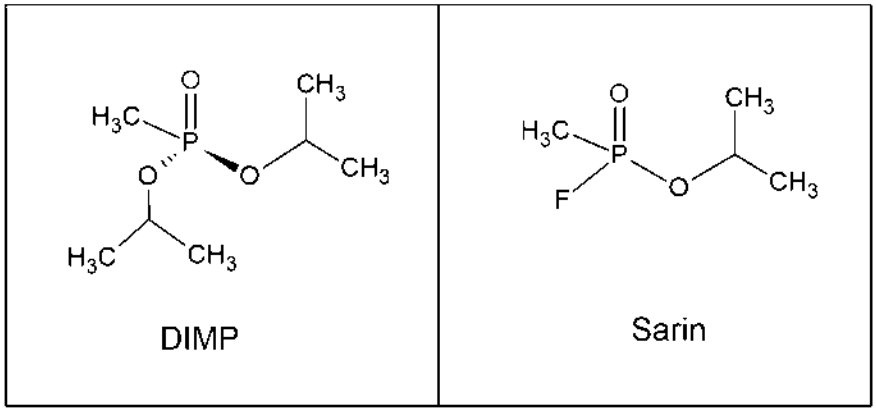


Figure 6-1. Molecular structures of DIMP and sarin

Glaude et al.[78] developed a reaction mechanism for DIMP using the experimental data from Zegers and Fisher[32] as the prime validation target. Since thermochemical data was not well defined for organophosphorus compounds, they used group additivity theory to estimate thermochemical properties

based on the data obtained from their theoretical calculations. They also used analogy with Diethyl methyl phosphonate (DEMP) to estimate rate parameters for the decomposition reaction of DIMP via six membered transition state. The pre-exponential factor was doubled considering twice the number of abstractable H atoms in DIMP than in DEMP. The activation energy for this reaction was then corrected to fit experimental data from Zeger and Fisher[32] at 799 K. Similar approach along with analogies from other OPC reactions and hydrocarbon reactions were used to estimate rate parameters for other reactions. The OPC sub mechanism developed in their work had a total of 63 species 274 reactions. At the time of their work, not many experimental works were available for DIMP to validate the developed mechanism.

In this chapter, the focus is on improving the kinetics of DIMP. Shock tube experiments were conducted with DIMP concentration varying between 0.1-0.4% in argon within the temperature range of 1300 K – 1800 K at ~1.5 atm pressure. Laser absorption spectroscopy was used to obtain carbon monoxide mole fraction time-histories during the experiments. The important unimolecular decomposition reactions of DIMP and IMP were revisited, and rates were calculated using complete basis set theoretical methods. Using the DIMP sub mechanism from Glaude et al.[78] as the base mechanism, a new reaction mechanism is developed. Additionally, reaction path analysis and sensitivity analysis are conducted to understand the important pathways and reactions leading to the formation of CO during DIMP pyrolysis.

6.2 Experimental methods

The experimental setup and methods are similar to our previous work on OPC compounds [76, 77] and therefore only details specific to DIMP are discussed here. Table 6-1 shows the experimental conditions for pyrolysis and oxidation of neat DIMP. The experimental conditions for doped studies of DIMP in methane, ethylene and hydrogen are shown in Table 6-2. As evident, these experiments capture a wide range of conditions ranging from lean to rich conditions and with different fuel loadings.

Table 6-1. Experimental conditions during pyrolysis and oxidation of neat DIMP.

Pyrolysis		Oxidation					
X_{DIMP}=0.1 %, X_{Ar}=99.9%		X_{DIMP}=0.1 %, Φ=0.5		X_{DIMP}=0.1 %, Φ=1.0		X_{DIMP}=0.1 %,Φ=2.0	
P_5 [atm]	T_5 [K]	P_5 [atm]	T_5 [K]	P_5 [atm]	T_5 [K]	P_5 [atm]	T_5 [K]
1.59	1428	1340	1.786	1450	1.75	1444	1.78
1.85	1533	1364	1.812	1534	1.714	1489	1.704
1.82	1579	1420	1.782	1600	1.657	1556	1.632
1.59	1782	1454	1.72	1663	1.586	1599	1.64
X_{DIMP}=0.2 %, X_{Ar}=99.8%		1504	1.669			1627	1.637
1.65	1567	1592	1.664			1669	1.58
1.52	1596						
X_{DIMP} −0.4 %, X_{Ar}−99.6%							
1.35	1532						

Table 6-2. Experimental conditions during doped studies of DIMP with methane, ethylene and hydrogen

X_{DIMP} =0.04 %, 0.4 % X_{CH4}, X_{O2} =1.6 %, Bal- Ar		X_{DIMP}=0.0286 %, X_{C2H4}=0.287, X_{O2}=1.713 %, Bal Ar		X_{DIMP} =0.1 %, X_{H2}=1.0%, X_{O2} =1.0 %, Bal Ar	
P_5 [atm]	T_5 [K]	P_5 [atm]	T_5 [K]	P_5 [atm]	T_5 [K]
1.69	1513	1.805	1197	1.934	1379
1.891	1549	1.911	1264	2.05	1446
1.828	1657	1.712	1381	2.017	1478
1.811	1674	1.716	1534	1.816	1553

6.3 Results and Discussion

6.3.1 Experimental Results

The carbon monoxide time-histories obtained during the pyrolysis and oxidation of neat DIMP mixture are shown in Figure 6-2. It is clear that with higher concentration of DIMP, more CO is produced during pyrolysis. However, the peak of CO produced during oxidation appears to be independent of the amount of oxygen present in the mixture for equivalence ratio ranging from 0.5-2.0.

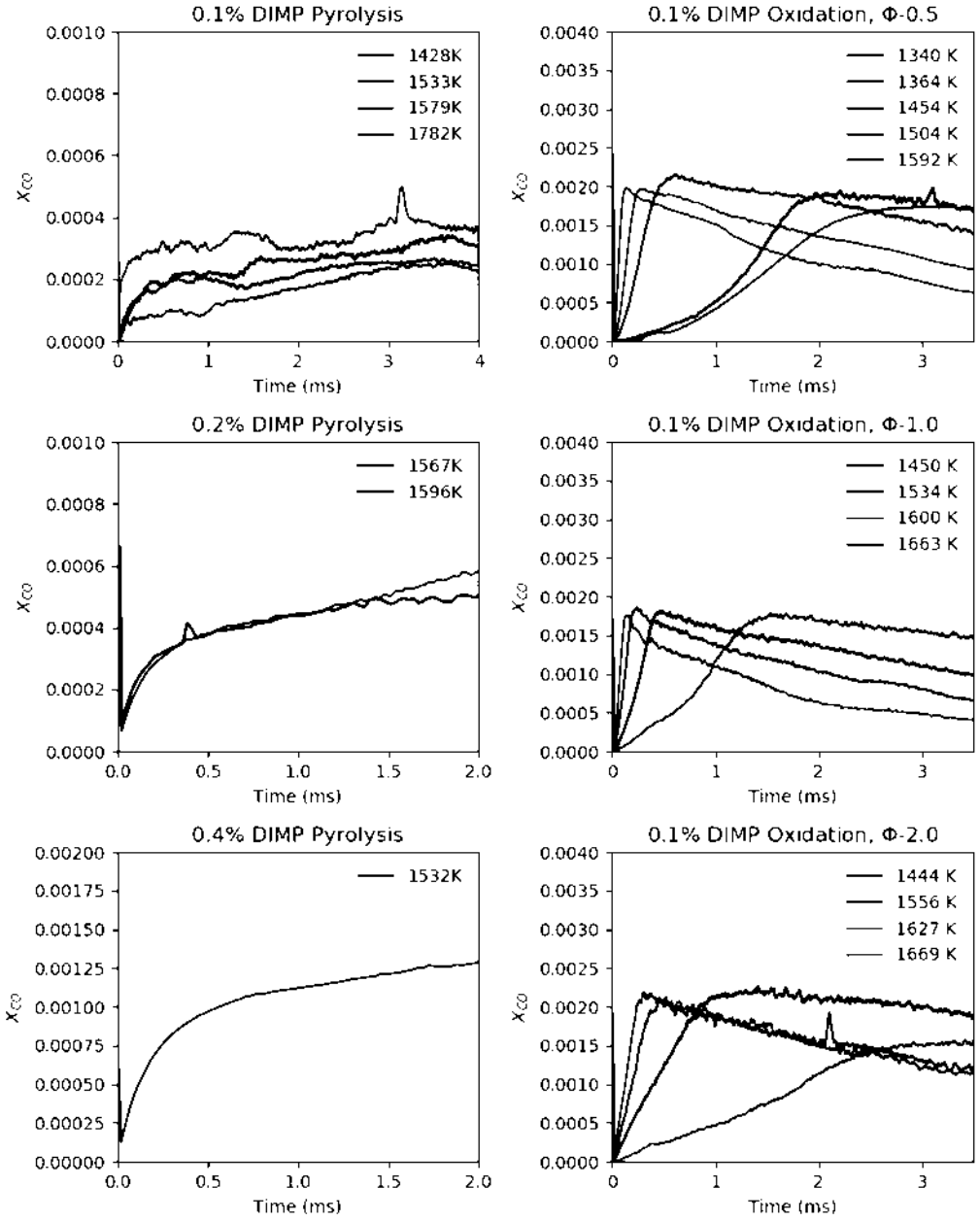


Figure 6-2. Carbon monoxide mole fraction time-histories obtained during pyrolysis of a)0.1% DIMP in argon, b) 0.2% DIMP in argon c) 0.4% DIMP in argon, d) lean oxidation, e) stoichiometric oxidation and f) rich oxidation of DIMP. Shaded region shows experimental uncertainty.

Experiments were also conducted with DIMP doped in methane, ethylene and hydrogen and the Co time-histories obtained are in Figure 6-3. To compare these results with mixtures without DIMP, respective neat mixtures were also shock heated to study the effect on CO formation time-histories.

In addition to CO time-histories, ignition delay was also captured during oxidation experiments using OH* emission signal. Results obtained are shown in Figure 6-4. As expected, leaner mixture is observed to ignite faster while the rich mixture has the largest ignition delay time. The ignition delay time obtained from DIMP doped experiments are shown in Figure 6-4. For methane, ignition becomes faster upon addition of DIMP while for ethane and hydrogen, opposite trend is observed. This can be related directly to the ignition delay of neat DIMP. When ignition delay of base fuel is longer than neat DIMP, addition of DIMP makes ignition faster. Conversely, if ignition delay of base fuel is shorter than neat DIMP, DIMP makes ignition slower.

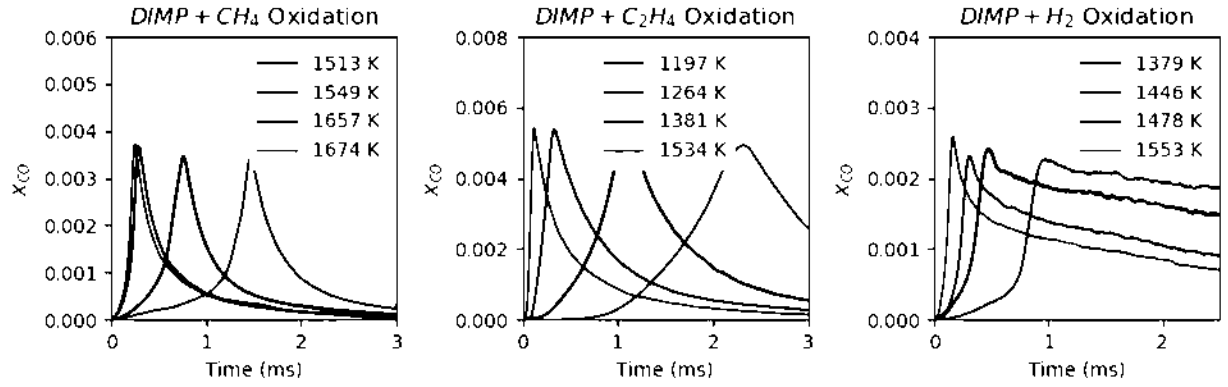


Figure 6-3. CO time-histories during the oxidation of a) CH4, b) C2H4 and c) H2 doped with DIMP.

a) Neat DIMP

b) Mixtures doped with DIMP

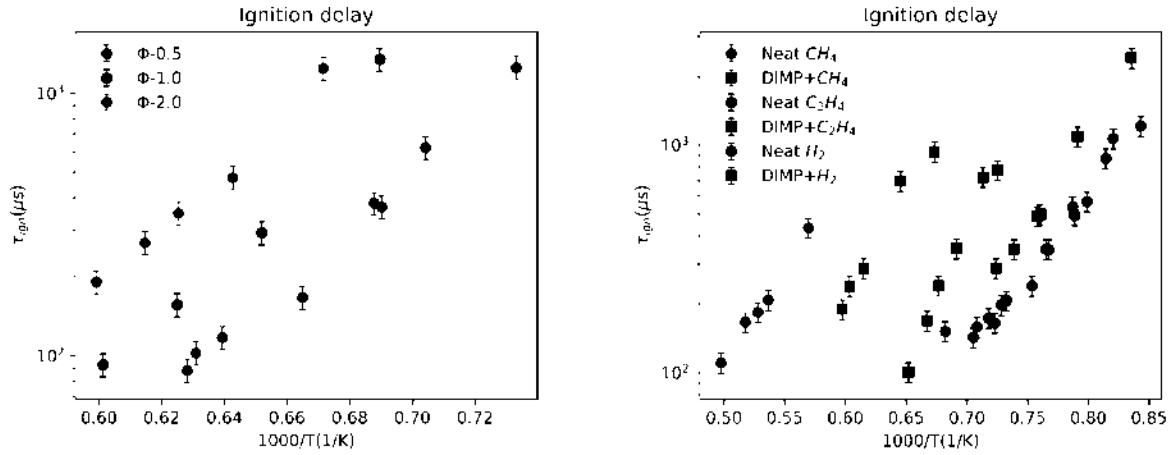


Figure 6-4. a) Ignition delay times for lean, stoichiometric and rich mixtures of 0.1% DIMP, b) Ignition delay times for mixtures of methane, ethylene and hydrogen with and without DIMP.

6.3.2 Model development

The state of the art model available for DIMP was the LLNL OPC mechanism developed by Glaude and co-workers[34]. The CO time-history prediction by this model was significantly different from experimental data obtained. Since this was the only mechanism available for public use, we used this mechanism as the base mechanism for this work. The prediction by LLNL model was improved by systematic sensitivity studies and by following steps:

1. Determining the reaction rates of key reactions in DIMP pyrolysis through ab-initio calculations. Table 6-3 shows the important reactions and their rates determined using theoretical calculations at CBS-QB3 level of theory.

Table 6-3. Calculated rates for reactions added for DIMP pyrolysis. The rate constants are expressed in the modified Arrhenius form, k = ΑTn exp(−Ea/RT). The units of the rate parameters, Α, n, and E are in cal, mol, cm, and s.

No.	Reaction	Α	n	Ea	Source
1	POME[OIPR]2 => PO[OH]ME[OIPR]+C3H6	2.97E+09	0.00	38533	pw (CBS-QB3), A/3
2	PO[OH]ME[OIPR]+C3H6=>POME[OIPR]2	1.14E-01	3.24	21390	pw (CBS-QB3)
3	POME[OIPR]2 = IC3H7OH+C3H6+CH3PO2	5.25E+10	0.80	55913	pw (CBS-QB3)
4	PO[OH]ME[OIPR] -> C3H6+PO[OH]2ME	6.78E+09	1.04	41019	pw (CBS-QB3)
5	C3H6+PO[OH]2ME => PO[OH]ME[OIPR]	7.50E-02	3.23	22066	pw (CBS-QB3)
6	PO[OH]ME[OIPR] => IC3H7OH+CH3PO2	9.06E+08	1.06	37214	pw (CBS-QB3)

7	IC3H7OH+CH3PO2 => PO[OH]ME[OIPR]	1.64E+08	1.13	6276	pw (CBS-QB3)
8	CH3PO2=>PO2+CH3	1.44E+13	0.51	67785	pw (CBS-QB3)
9	PO2+CH3=>CH3PO2	8.15E+11	0.13	-8313	pw (CBS-QB3)
10	PO[OH]2ME+H=>CH4+PO[OH]2	8.15E+11	0.60	34680	pw (CBS-QB3)
11	CH4+PO[OH]2=>PO[OH]2ME+H	9.06E+11	-0.01	45495	pw (CBS-QB3)

2. Improved thermochemistry for stable species and radical formed during DIMP decomposition. Table 6-4 shows the new thermochemical data added as part of this work. All thermodynamic parameters were calculated at CBS-QB3 level of theory.

Table 6-4. Thermodynamic data for important species during DIMP decomposition at high temperature calculated using CBS-QB3 composite method.

Species	$\Delta_f^\circ H_{298K}$ (Kcal mol^{-1})	S°_{298K} (Cal mol^{-1} K^{-1})	C_p° (Cal mol-1 K-1)			
			500 K	1000 K	1500 K	2000 K
POME[OIPR]2	-243.12	124.42	83.00	120.95	138.80	147.82
IPROPO2	-184.54	93.87	43.47	61.06	69.00	72.94
PO[OH]ME[OIPR]	-231.83	103.46	58.41	82.31	93.60	99.39
PO[OH]2ME	-218.61	82.51	33.97	43.72	48.42	50.98
CH3PO2	-118.78	69.28	20.71	28.02	31.33	32.99
POMEOIPR[OTC3H6]	-198.13	130.22	81.86	117.64	134.41	142.86
POMEOIPR[OPC3H6]	-191.86	128.13	82.58	117.80	134.39	142.80
PO[OIPR]2[CH2]	-190.81	127.38	82.19	117.64	134.32	142.77
POME[OIPR]O	-168.02	103.84	55.92	78.56	89.09	94.41
POME[OIPR]	-118.33	98.70	51.12	72.97	83.31	88.55
PO[OH]ME[OTC3H6]	-186.22	106.72	57.23	78.98	89.19	94.41
PO[OH]ME[OPC3H6]	-180.17	107.63	58.12	79.25	89.24	94.41

POMEOIPR[OCHCH3]	-187.20	122.66	73.45	104.67	119.30	126.69
CH2PO2	-69.60	70.07	21.64	26.63	28.81	29.92
CH3PO	-40.08	68.91	18.93	24.92	27.81	29.29

3. Including other decomposition pathways for smaller phosphorous species by analogy and from other sources. These reactions are shown in Table 6-5.

Table 6-5. New reactions added for DIMP pyrolysis from analogies and other sources. The rate constants are expressed in the modified Arrhenius form, $k = AT^n \exp(-Ea/RT)$. The units of the rate parameters, A, n, and E are in cal, mol, cm, and s.

No.	Reaction	A	n	Ea	Source
1	CH3PO2+H=HPO2+CH3	3.30E+12	0.00	3730	
2	CH3PO2+H=CH3PO+OH	1.40E+12	0.00	3730	
3	CH3PO2+H=CH2PO2+H2	4.90E+13	0.00	9220	pw, from Nitromethane kinetics [79-81]
4	CH3PO2+O=CH2PO2+OH	1.50E+13	0.00	5350	
5	CH3PO2+OH=CH2PO2+H2O	5.00E+05	2.00	1000	
6	CH3PO2+HO2=CH2PO2+H2O2	3.00E+12	0.00	23000	

7	CH3PO2+O2=CH2PO2+HO2	2.00E+13	0.00	57000	
8	CH3PO2+CH3=CH2PO2+CH4	5.50E-01	4.00	8300	
9	CH3PO2+CH3O=CH2PO2+CH3OH	3.00E+11	0.00	7000	
10	CH3PO2+PO2=CH2PO2+HOPO	3.00E+11	0.00	32000	
11	CH2PO2=CH2O+PO	1.00E+13	0.00	36000	
12	CH2PO2+H=CH3+PO2	5.00E+13	0.00	0	
13	CH2PO2+O=CH2O+PO2	5.00E+13	0.00	0	
14	CH2PO2+OH=CH2OH+PO2	1.00E+13	0.00	0	
15	CH2PO2+OH=CH2O+HOPO	1.00E+13	0.00	0	
16	CH2PO2+CH3=C2H5+PO2	5.00E+13	0.00	0	
17	PO[OH]2ME+M= CH3PO2+H2O+M	2.30E+12	0.04	41900	[82]
18	PO[OH]2ME+M= HOPO2+CH4+M	6.30E+11	0.41	64100	[82]

19	PO[OH]2CH2+H=PO[OH]2ME	1.00E+14	0.00	0	Collision limit
20	PO[OH]2ME+H=PO[OH]2CH2+H2	7.20E+08	1.50	10650	Analogy from IMP
21	PO[OH]2ME+O2 = PO[OH]2CH2+HO2	1.40E+11	0.00	48000	Analogy from IMP
22	PO[OH]2ME+O = PO[OH]2CH2+OH	5.00E+08	1.50	9475	Analogy from IMP
23	PO[OH]2ME+OH = PO[OH]2CH2+H2O	1.00E+06	2.39	-1140	[82]
24	PO[OH]2ME+CH3 = PO[OH]2CH2+CH4	2.40E+06	1.87	17360	Analogy from IMP

4. Adding improved sub-mechanism for isopropanol chemistry: Shock tube experiments were conducted to understand which mechanism from literature captures isopropanol kinetics better. Results revealed that under our experimental conditions, Li et. al[83] predicts CO formation to a reasonable accuracy. Performance of several isopropanol mechanisms from literature along with the shock tube experiments conducted at UCF are shown in Figure 6-5.

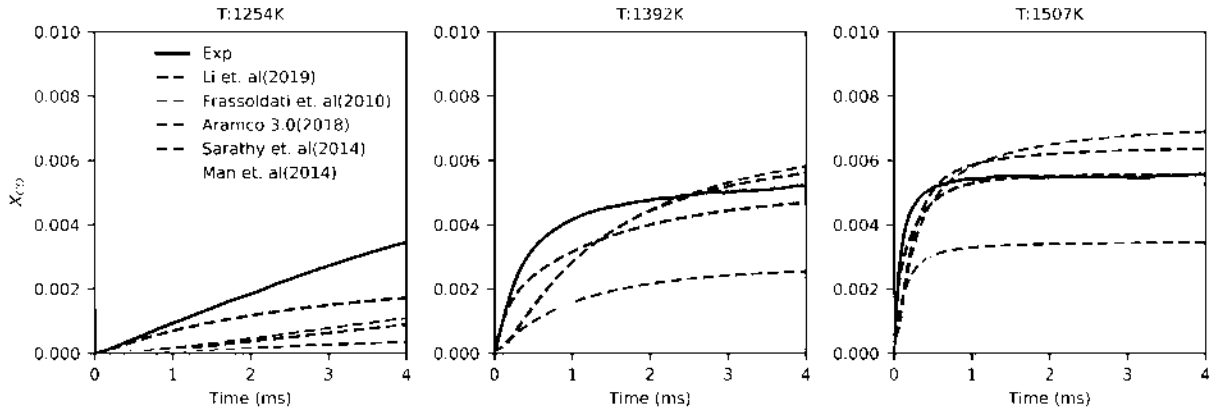


Figure 6-5. Carbon monoxide concentration time histories during pyrolysis of isopropanol. Mixture is 1% isopropanol in argon. Solid line is experimental results from this work and dashed lines are simulation results. Shaded region shows the experimental uncertainty (<10%).

5. Adding H-abstraction reactions for DIMP and IMP by O and OH:

In oxidation environment, reactions of DIMP with O atoms and OH atoms is an important pathway and hence the reaction rates for these H-abstraction reactions were determined at B3LYP level of theory. The reactions along with rates used are provided in Table 6-6. The key H- abstraction reactions forming radicals of DIMP are multiplied by a factor of 3 which is within the uncertainty limits of theoretical calculations.

Table 6-6. New reactions added for DIMP h-abstraction from theoretical calculations. The rate constants are expressed in the modified Arrhenius form, k = ATn exp(−Ea/RT). The units of the rate parameters, A, n, and E are in cal, mol, cm, and s.

No.	Reaction	A	n	Ea	Source
1	POME[OIPR]2 +OH => POMEOIPR[OPC3H6]+H2O	2.88E+13	0.39	912	pw (B3LYP)x3
2	POMEOIPR[OPC3H6]+H2O-> POME[OIPR]2 + OH	1.70E+12	0.11	13791	pw (B3LYP)

3	POME[OIPR]2 +OH => POMEOIPR[OTC3H6]+H2O	2.53E+12	0.22	-1381	pw (B3LYP)x3
4	POMEOIPR[OTC3H6]+H2O=> POME[OIPR]2 + OH	1.83E+12	-0.46	20398	pw (B3LYP)
5	POME[OIPR]2 +OH => PO[OIPR]2[CH2]+H2O	2.51E+12	0.44	495	pw (B3LYP)x3
6	PO[OIPR]2[CH2]+H2O=> POME[OIPR]2 + OH	1.64E+12	-0.07	13410	pw (B3LYP)
7	POME[OIPR]2 +O -> POMEOIPR[OPC3H6]+OH	1.52E+12	0.70	2977	pw (B3LYP)
8	POMEOIPR[OPC3H6]+OH=> POME[OIPR]2 + O	1.10E+13	-0.03	4075	pw (B3LYP)
9	POME[OIPR]2 +O => POMEOIPR[OTC3H6]+OH	1.26E+12	0.68	-1105	pw (B3LYP)
10	POMEOIPR[OTC3H6]+OH=> POME[OIPR]2 + O	1.95E+11	0.34	7560	pw (B3LYP)
11	POME[OIPR]2 +O => PO[OIPR]2[CH2]+OH	2.44E+12	0.48	4895	pw (B3LYP)
12	PO[OIPR]2[CH2]+OH=> POME[OIPR]2 + O	2.72E+12	0.05	5132	pw (B3LYP)
13	PO[OH]ME[OIPR]+OH => PO[OH]ME[OPC3H6]+H2O	1.44E+13	0.39	912	From DIMP
14	PO[OH]ME[OPC3H6]+H2O=> PO[OH]ME[OIPR]+OH	8.52E+11	0.11	13791	From DIMP
15	PO[OH]ME[OIPR]+OH => PO[OH]ME[OTC3H6]+H2O	1.27E+12	0.22	-1381	From DIMP
16	PO[OH]ME[OTC3H6]+H2O=> PO[OH]ME[OIPR]+OH	9.16E+11	-0.46	20398	From DIMP
17	PO[OH]ME[OIPR]+OH -> POOH[OIPR][CH2]+H2O	2.50E+12	0.44	495	From DIMP

18	POOH[OIPR][CH2]+H2O=> PO[OH]ME[OIPR]+OH	1.64E+12	-0.07	13410	From DIMP
19	PO[OH]ME[OIPR]+O => PO[OH]ME[OPC3H6]+OH	7.62E+11	0.70	2977	From DIMP
20	PO[OH]ME[OPC3H6]+OH-> PO[OH]ME[OIPR]+O	5.48E+12	-0.03	4075	From DIMP
21	PO[OH]ME[OIPR]+O => PO[OH]ME[OTC3H6]+OH	6.32E+11	0.68	-1105	From DIMP
22	PO[OH]ME[OTC3H6]+OH=> PO[OH]ME[OIPR]+O	9.75E+10	0.34	7560	From DIMP
23	PO[OH]ME[OIPR]+O => POOH[OIPR][CH2]+OH	2.45E+12	0.48	4895	From DIMP
24	POOH[OIPR][CH2]+OH=> PO[OH]ME[OIPR]+O	2.72E+12	0.05	5132	From DIMP

6. Determining reaction rates for small phosphorous species

The role of small phosphorous species in consuming radicals through chain reactions is very well known[84]. However, the rates of those reactions are still not clear. In this work we determine rates of some of these reactions (shown in Table 6-7) which are important in prediction of oxidation of DIMP. These reactions along with their rates are shown in Table 6-7. We have also found a new reaction pathway involving phosphorous trioxide directly converting carbon monoxide to carbon dioxide and phosphorous dioxide.

Table 6-7. New reactions added for smaller phosphorous species from theoretical calculations. The rate constants are expressed in the modified Arrhenius form, k = ATn exp(−Ea/RT). The units of the rate parameters, A, n, and E are in cal, mol, cm, and s.

No.	Reaction	A	n	Ea	Source

1	HOPO+OH=>PO2+H2O	8.15E+11	0.111007	2805.903	pw (CBS-QB3)
2	PO2+H2O=>HOPO+OH	9.06E+11	-0.08848	30098.36	pw (CBS-QB3)
3	HOPO+O =>OH+PO2	1.27E+11	0.50516	9410.259	pw (CBS-QB3)
4	OH+PO2 =>HOPO+O	9.13E+11	0.079509	23349.23	pw (CBS-QB3)
5	HPO2+H=>H2+PO2	8.15E+11	0.729873	3271.159	pw (CBS-QB3)
6	H2+PO2=>HPO2+H	9.06E+11	0.508448	28506.41	pw (CBS-QB3)
7	PO2+CH3=>CH3PO2	8.15E+11	0.126427	-8313.16	pw (CBS-QB3)
8	CH3PO2=>PO2+CH3	9.06E+11	0.859308	63965.87	pw (CBS-QB3)
9	PO3+CO=>PO2+CO2	6.32E+11	0.16746	11742.28	pw (CBS-QB3)
10	PO2+CO2=>PO3+CO	9.75E+10	0.656224	40246.21	pw (CBS-QB3)

7. Reactions to account for char formation

One of the mechanism by which organophosphorus species inhibits fire is by char formation[85]. During the experiments conducted in this work, char formation was observed in the test section after experiments. In order to account for these, reactions shown in Table 6-8 were included in the model. It is to be noted that

we have assumed species CS1, CS2 and CS3 (representing char/soot) are inert and does not involve in further reactions. The rates for these reactions are based on experimental fitting for CO time histories of neat DIMP mixtures.

Table 6-8. New reactions added for representing char formation from DIMP. The rate constants are expressed in the modified Arrhenius form, k = ATn exp(−Ea/RT). The units of the rate parameters, A, n, and E are in cal, mol, cm, and s.

No.	Reaction	A	n	Ea	Source
1	PO[OH]ME[OIPR]+C3H6 => CS1 +OH	1.52E+03	5.43	30746	Estimated
2	PO[OH]ME[OIPR]+C2H4 => CS2 +OH	1.52E+03	5.43	30746	Estimated
3	PO[OH]ME[OIPR]+CH4 => CS3 +OH	1.52E+03	5.43	30746	Estimated

6.3.3 Validation

1. Pyrolysis of neat DIMP

Using these modifications, simulations were conducted using 0-D reactor at constant pressure for pyrolysis of DIMP. The results are shown in Figure 6-6 to 6-8. The new model predicts CO formation within uncertainty limits of experiments for 0.1%, 0.2% and 0.4% DIMP pyrolysis.

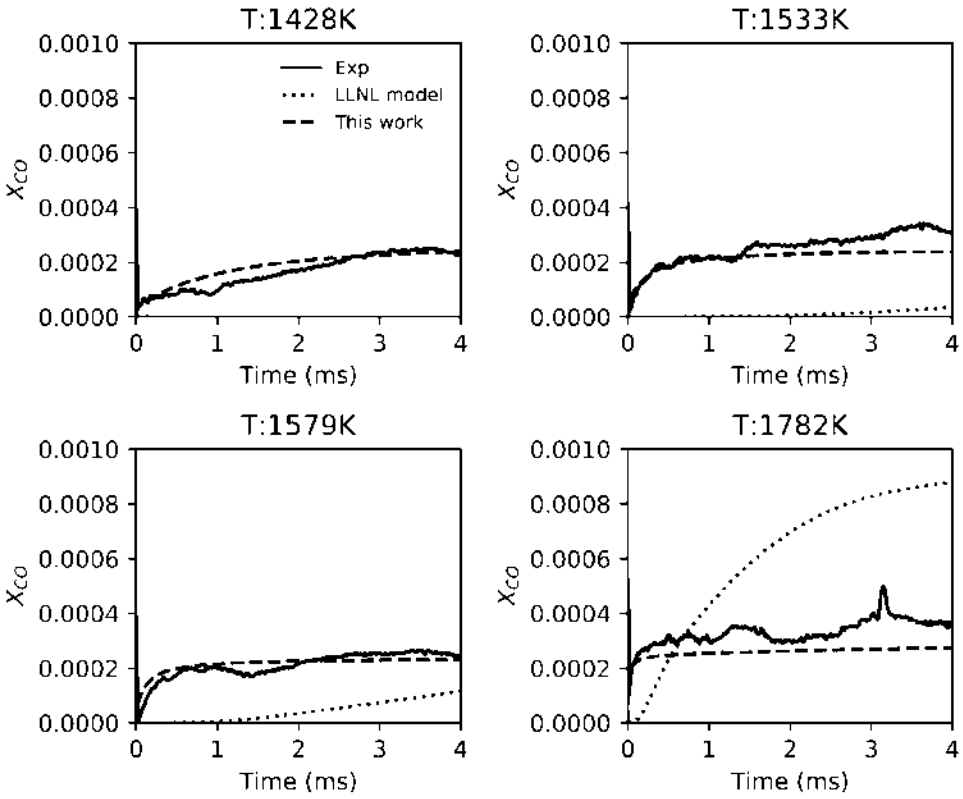


Figure 6-6. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for 0.1 % DIMP in argon at different temperatures. Shaded region shows the uncertainty in experiments.

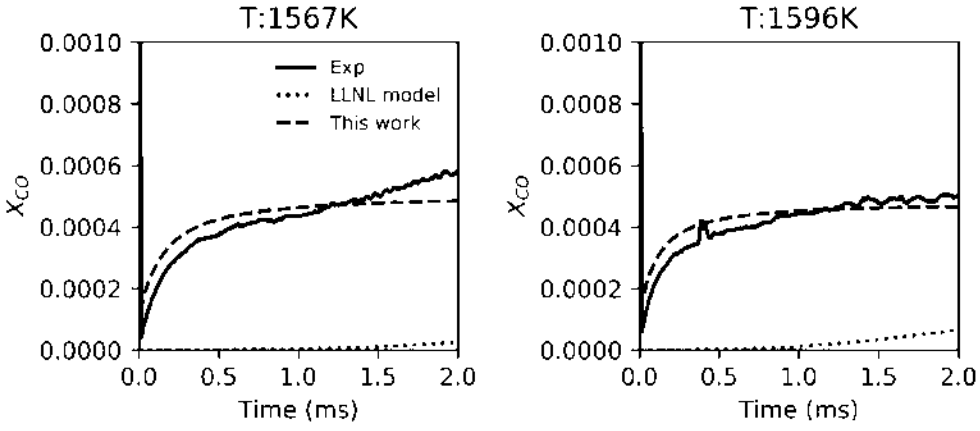


Figure 6-7. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for 0.2 % DIMP in argon at different temperatures. Shaded region shows the uncertainty in experiments.

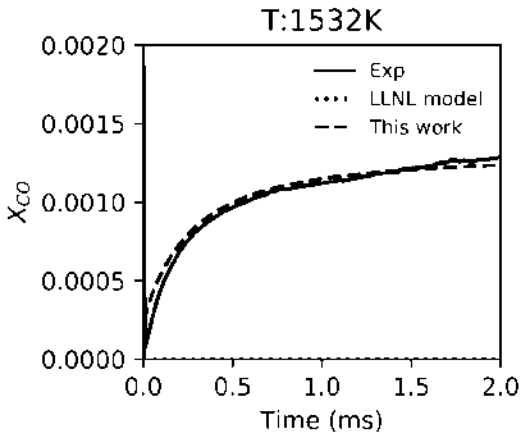


Figure 6-8. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for 0.4 % DIMP in argon at different temperatures. Shaded region shows the uncertainty in experiment.

2. Oxidation of neat DIMP: Results for oxidation of DIMP at equivalence ratio 0.5, 1.0 and 2.0 are shown in figure 9,10 and 11 respectively. At high temperature, very good agreement is observed with experimental results. At temperature less than 1500 K, model predicts the trend in CO time-histories and has improved significantly from LLNL model. Further experiments are required to improve model predictions at these conditions.

Φ-0.5

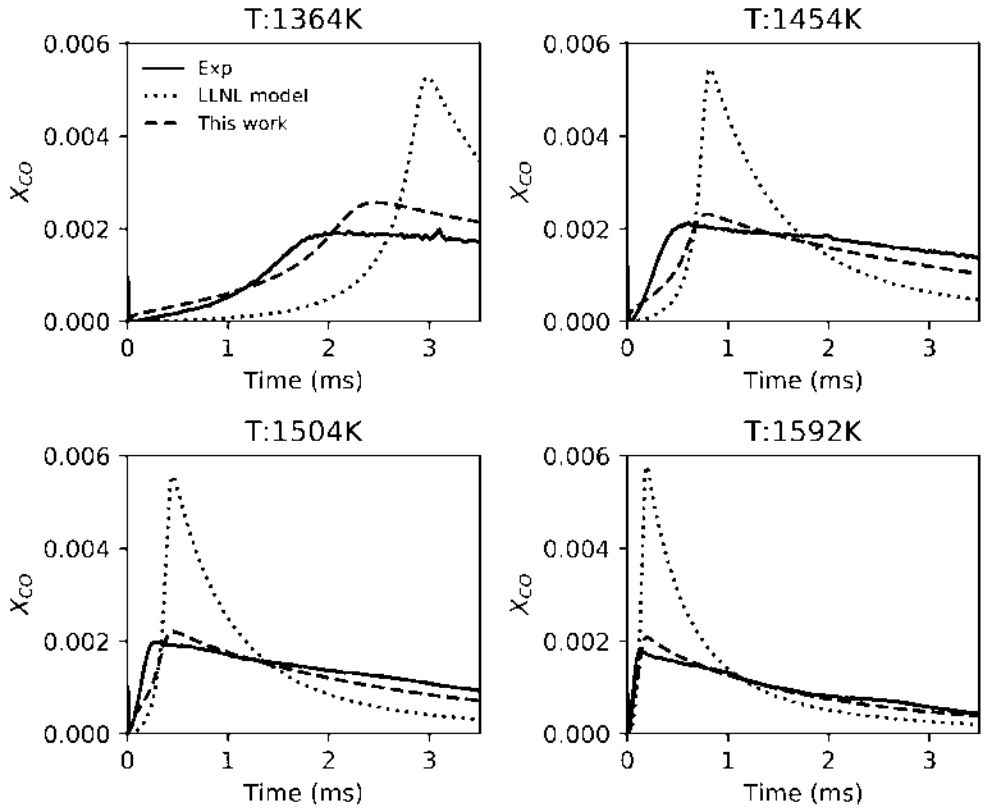


Figure 6-9. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of 0.1 % DIMP at equivalence ratio 0.5 at different temperatures. Shaded region shows the uncertainty in experiment.

Φ-1.0

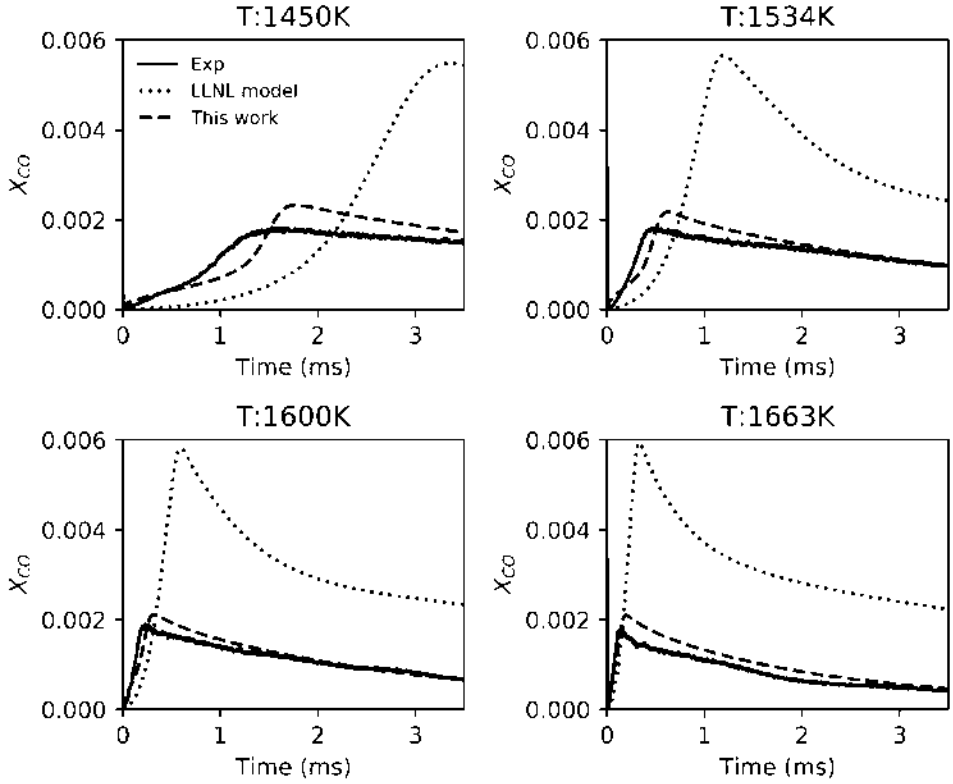


Figure 6-10. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of 0.1 % DIMP at equivalence ratio 1.0 at different temperatures. Shaded region shows the uncertainty in experiment.

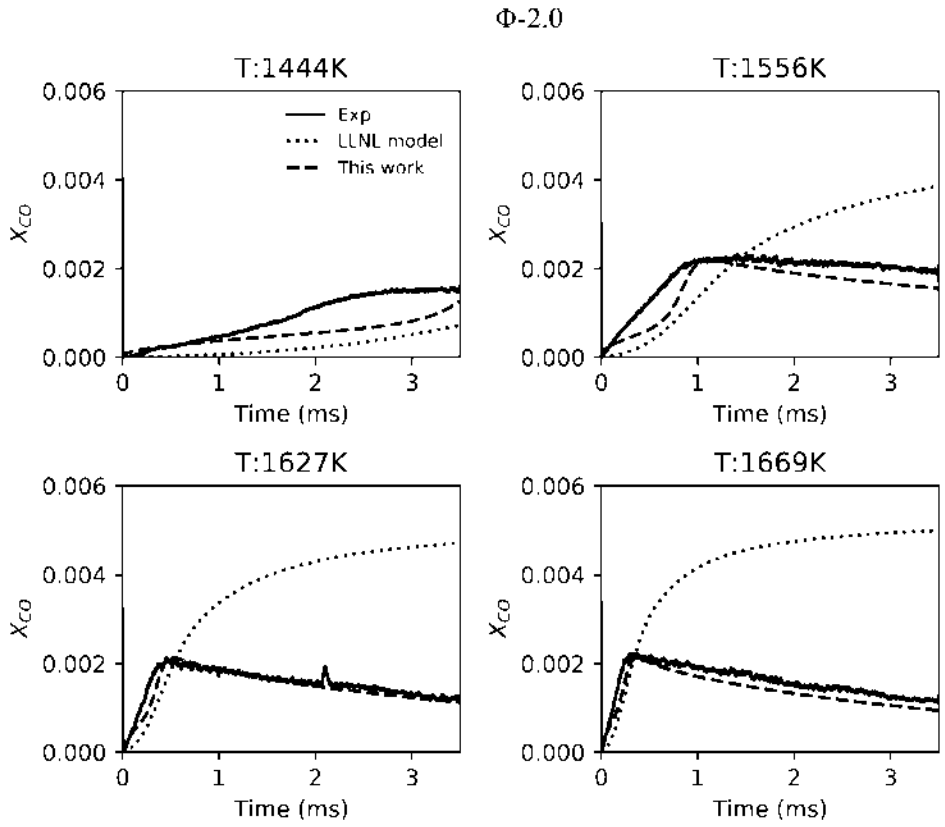


Figure 6-11. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of 0.1 % DIMP at equivalence ratio 2.0 at different temperatures. Shaded region shows the uncertainty in experiment.

3. DIMP doped in methane, ethylene and hydrogen:

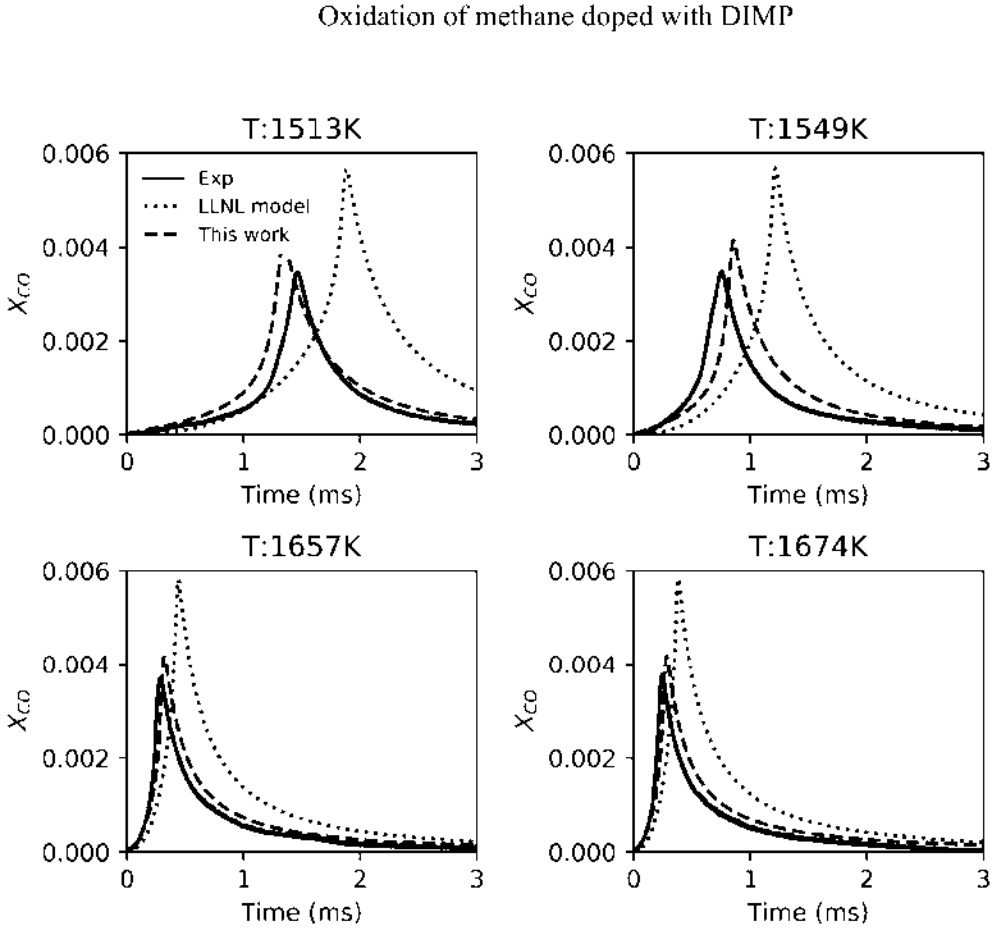


Figure 6-12. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of methane doped with DIMP.

Oxidation of ethylene doped with DIMP

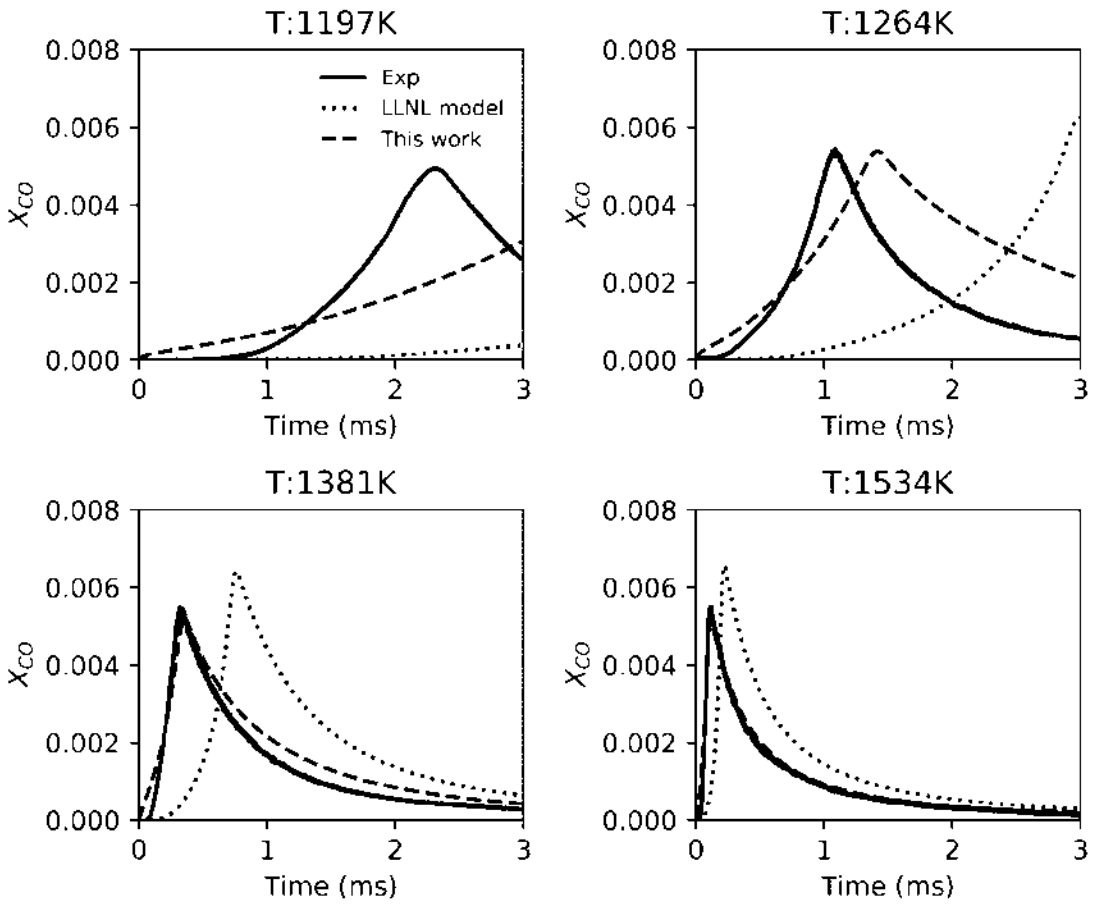


Figure 6-13. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of ethylene doped with DIMP.

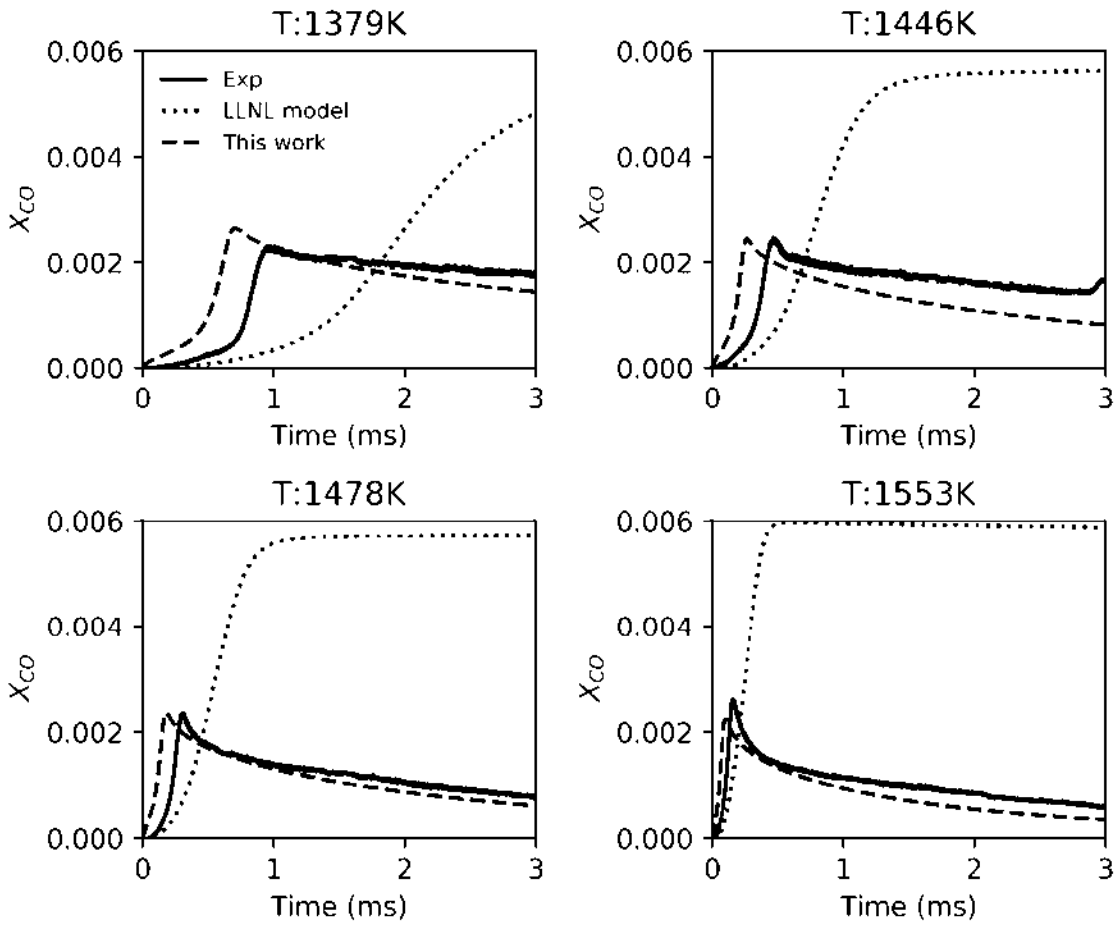


Figure 6-14. Comparison of predicted vs experimentally obtained CO mole fraction time-histories for oxidation of hydrogen doped with DIMP.

Figure 6-12 to 6-14 shows predictions by LLNL model and the model developed in this work against the experimental results. It is evident that the new model predicts CO time-histories during oxidation of DIMP doped hydrocarbons and hydrogen to a good degree of accuracy at high temperatures. Further research is required in low temperature regime to improve its predictions.

Figure 6-15 shows a comparison of ignition delay prediction by the model developed in this work with experimental results. The model captures the trend in ignition delay especially with increase in equivalence ratio. LLNL model predicts ignition delay for equivalence ratio 1 and 2 to be close to each other while the model developed in this work predicts a significant difference in ignition delay with increase in equivalence ratio. For DIMP doped experiments, ignition delay predicted by the model developed in this work is significantly better than the LLNL model.

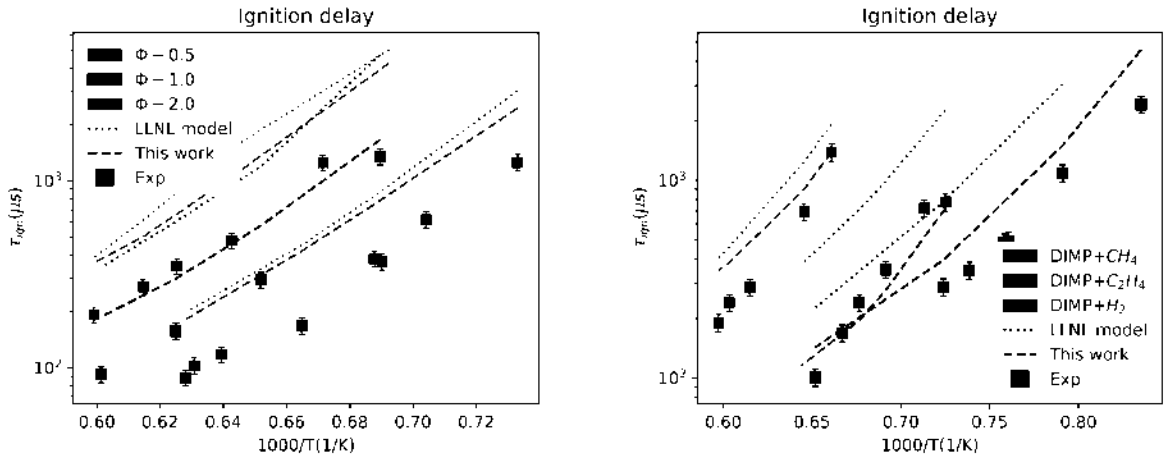


Figure 6-15. Ignition delay vs inverse temperature for a) neat DIMP oxidation and b) doped studies.

6.4 Conclusions

Shock tube experiments were conducted for pyrolysis of a chemical warfare surrogate DIMP within temperature range of 1428 - 1782 K at near 1.5 atm pressure. Laser absorption spectroscopy was used to obtain carbon monoxide mole fraction time-histories for DIMP concentrations ranging from 0.1-0.4%. Shock tube experiments were conducted for isopropanol pyrolysis and performance of models available in the literature for capturing CO mole fraction time-histories were evaluated. Li et al.[83] model was identified as a suitable candidate for isopropanol sub mechanism. Thermochemical properties of key species involved in DIMP pyrolysis were calculated using CBS-QB3 composite method. This method combined with transition state theory was also employed to evaluate reaction rates of important reactions involved in DIMP pyrolysis. The reaction rate parameters for MOPO were adopted from nitromethane kinetics while those for reactions of MPA were obtained from the literature. Other reactions involved in DIMP pyrolysis were estimated from analogous reactions of similar species. These new reaction rates and isopropanol sub mechanism were merged with DIMP sub mechanism from LLNL OPC mechanism to obtain new reaction mechanisms for DIMP. In general, the model improved the prediction of CO during high temperature pyrolysis and oxidation of DIMP significantly compared to literature models.

Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia / Epstein
CBEP-Thrust Area 6, CC WMD

Statement of Work

Project Title: Serological Biosurveillance for Spillover of *Henipaviruses* and *Filoviruses* at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia

Document Date: May 2016

Objective: The objective of this project is to enhance capacity within the Malaysia government to characterize the distribution of and detect spillover of novel and known henipaviruses and filoviruses, (both groups include high consequence zoonotic pathogens) in indigenous populations and farms in Peninsular Malaysia. Current surveillance strategies for novel zoonotic viruses rely exclusively on molecular detection tools, but Nipah and Ebola viruses are present at low prevalence in bat species which makes infected individuals difficult to detect. By establishing a multiplexed serological assay developed to detect antibodies against any henipa- and filoviruses, the Government of Malaysia (GoM) will more effectively be able to determine the distribution of these high-impact viruses in wildlife reservoirs and detect evidence of spillover in at-risk human or livestock populations. This enhancement of human and animal surveillance in all three sectors (wildlife, livestock and human health) and training of Malaysian scientists utilizes a One Health approach and will help reduce risk of zoonotic disease emergence and spread by accelerating detection and response. These activities fulfill DTRA CBEP's mandate and are also complementary to and supportive of the aims of the USAID EPT program and the Global Health Security Agenda.

Scope: This research includes transferring state-of-the art serological reagents and Luminex-based microsphere beaded technology that will allow the Government of Malaysia to use a One Health approach to conduct serological surveillance for all known *and unknown* henipaviruses and filoviruses in wildlife, domestic animals, and humans. The study will test archived human and wildlife serum samples which are linked to PCR-tested oral, rectal, or urogenital swab samples (collected and tested under the ongoing USAID Emerging Pandemic Threats: PREDICT program and a University of Malaya study of Orang Asli healthy populations and acutely febrile hospital cases). It will also conduct a new study looking at henipa- and filovirus antibodies in livestock and farm workers and wildlife near the farms, as well as an expanded Orang Asli study focused on hunting communities living in the forest. The grantee will investigate spillover of these pathogens by screening wildlife reservoirs (e.g. bats and nonhuman primates), people, and livestock for IgG antibodies to henipaviruses and filoviruses, while also continuing to develop and transfer additional tests that will detect antibodies against novel viruses in these groups.

Our team will focus on the following major goals and milestones:

1. Improve the Government of Malaysia's capacity to conduct serological surveillance for henipaviruses and filoviruses in human and animal populations, using a One Health approach.
    - Transfer Luminex-based technology into government and university diagnostic labs in three key sectors (wildlife, livestock, and human health); conduct trainings for staff to be able to screen samples, interpret results, and perform confirmatory assays; train local graduate students; and publish and share findings among GoM partners.
2. Determine the host distribution and seroprevalence of henipaviruses and filoviruses in wildlife (e.g. bat) populations in Peninsular Malaysia associated with Orang Asli communities and livestock farms.

- Conduct cross-sectional serological studies of humans and animals for henipa- and filoviruses by testing sera from new samples collected under this project and archived samples from PREDICT. Wildlife sampling will be conducted jointly with the Dept. of Wildlife and National Parks (DWNP); livestock sampling with DVS and UPM; and human sampling with MoH. These activities provide opportunity for One Health-based disease surveillance; threat reduction; and capacity building within the Government of Malaysia.

3. Conduct surveillance for IgG antibodies against filoviruses and henipaviruses in people and domestic animals which may indicate spillover from wildlife reservoirs. Sampling activities will focus on Orang Asli communities and farms in Peninsular Malaysia and will be conducted jointly with the Ministry of Health's National Public Health Laboratory (NPHL), DWNP, and the University Putra Malaysia under the Department of Veterinary Services (DVS). Serological surveillance will allow the GoM to focus limited resources and develop interventions to reduce threat from viral outbreaks in at-risk animal and human populations.

- Qualitative studies (e.g. questionnaires) detailing human-animal contact where sampling occurs will characterize high-risk behaviors and interfaces;
- Sampling human, wildlife, and domestic animal populations in Orang Asli forest communities that practice hunting.
- Sampling domestic animals and farm workers on large and small-scale farms and associated wildlife to identify evidence of spillover.

Our research will be focused on building capacity within the Government of Malaysia to conduct serological surveillance in human and animal populations in Peninsular Malaysia where people and animals are believed to have high levels of contact. Collaborators from the Government of Malaysia (GoM)'s Department of Wildlife and National Parks (DWNP), the Ministry of Health's National Public Health Laboratory (NPHL), the Department of Veterinary Service's University Putra Malaysia (UPM), University of Malaysia (UM), The Uniformed Services University, Maryland (USU), Conservation Medicine, Ltd. (CM), The US Navy Medical Research Center, Asia (NMRC-A), and Duke-NUS Graduate Medical School, Singapore (Linfa Wang lab) will play active roles in this research. EHA's history of successful collaboration with DWNP, MoH, and DVS under prior research projects and most recently through PREDICT, as well as having a Memorandum of Agreement with the aforementioned institutions, gives us confidence that we will be able to achieve the aims of this proposal (also see letters of collaboration).

The duration of the proposed project is three years, with optional 4th and 5th years containing follow-up Orang Asli studies and farm studies so that we have longitudinal data. These option years will significantly strengthen the overall study by enhancing our ability to detect temporal patterns of infection in bat and other animal populations as well as additional opportunity to detect spillover in humans or livestock. **Through these proposed activities we would create enhanced One Health surveillance for known *and novel* henipaviruses and filoviruses in human and animal populations in Peninsular Malaysia, an emerging disease hotspot**. The proposed activities would significantly support Malaysia's surveillance priorities, DTRA CBEP Thrust Area 6 objectives, the Global Health Security Agenda (GHSA), and the USAID Emerging Pandemic Threats program by allowing the Government of Malaysia to more rapidly detect infections of high impact zoonotic agents and develop effective interventions to prevent viral

outbreaks and reduce human and animal mortality, thereby reducing the threat from these high consequence viral agents.

Background:

Nipah virus (NiV), Ebola virus (EBOV) and Marburg Virus (MARV) are emerging zoonotic viruses belonging to the genera *Henipavirus* (Family *Paramyxoviridae*), *Ebolavirus* and *Marburgvirus* (both Family *Filoviridae*) and they have each caused outbreaks in people with high mortality rate. These viruses are listed as a select agents by HHS and USDA as pathogens of significant threat to both human and animal health. Nipah virus (NiV) is a zoonotic paramyxovirus (genus *Henipavirus*) with pandemic potential that first emerged on a pig farm in Malaysia in 1997 and led to a human outbreak with more than 260 cases and 40% mortality. Old world frugivorous bats, particularly Genus *Pteropus* (Family *Pteropodidae*), are natural reservoirs for a range of henipaviruses, including Nipah virus. Filoviruses circulate both in Africa and Southeast Asia, and have also been linked to bat reservoirs. In Africa, EBOV and Sudan virus (SUDV) have caused multiple human outbreaks with mean mortality rates between 50% and 90%. The current EBOV outbreak in West Africa, by far the largest Ebola epidemic in history, has had more than 28,600 cases, primarily in Sierra Leone, Guinea, and Liberia, with a mortality rate of 40%. The outbreak in West Africa has prompted the Government of Malaysia to determine whether filoviruses are circulating in bat species resident in Peninsular Malaysia. Malaysia's experience with Nipah virus, existing technical expertise, and its current commitment to using a One Health approach to disease surveillance (e.g. surveillance for novel zoonoses under PREDICT in all three sectors: wildlife, livestock, and human health) make it an ideal place to establish an advanced serological platform for detection of henipavirus and filovirus antibodies in wildlife and at-risk livestock and human populations.

Preliminary data: Serological studies of Nipah virus and Ebola virus using the Luminex-based platform. Studies conducted by our group have shown that NiV viral prevalence in pteropid bats is low (~1%-3%) and there is temporal variation to shedding. Mean seroprevalence in *P. vampyrus,* which is found across Peninsular Malaysia was 32% (n=253; range 16.7% - 42.4%). In Bangladesh, we conducted a 6-year longitudinal study of *Pteropus giganteus* using the Luminex-based platform to screen bats for IgG antibodies against both Nipah virus and Ebola virus Zaire. Between 20% and 80% of adult *Pteropus giganteus* were NiV seropositive, while between 20% and 50% were EBOV seropositive (Epstein et al, *in prep*). Nipah virus infections appear to peak in June/July while EBOV appears to peak in December (see also Project Narrative). We found a diversity of genetic strains of Nipah virus in *P. giganteus* (Epstein et al., *in prep*), and viruses which are NiV-like but distinct henipaviruses. Non-neutralizing antibodies against NiV-like viruses found in goats, cattle, and pigs in Bangladesh suggests that spillover from bats to domestic animals occurs and that there is a broad spectrum of henipaviruses circulating in bats. RESTV RNA was recently identified by our group in *Mineopterus schreibersii,* a common insectivorous bat. We also detected RESTV antibodies in two fruit bat species: *Cynopterus brachyotis* and *Pteropus vampyrus:* the latter is a NiV reservoir. In Bangladesh, we found antibodies against EBOV and RESTV in 3.5% of *Rousettus leschenaultii* (n=141). *M. schreibersii*, *R. leschenaultii*, and two *Pteropus* species, including *P. vampyrus* all occur in Malaysia, yet there is no data available regarding filoviruses in wildlife in Malaysia. The possibility that multiple henipaviruses or filoviruses capable of infecting people or livestock

to be circulating in bats in Malaysia makes enhanced surveillance and early detection of these high consequence viruses critically important for reducing their threat to public health.

PREDICT
Between 2009 and 2015, EHA, CM, and the Department of Wildlife and National Parks (DWNP) have collected and archived samples, including serum, from more than 1,400, animals including bats, rodents, and macaques all from areas where people and wildlife come into contact. While oropharyngeal, urogenital, and rectal swab samples have been or will be screened using PCR assays for viral families (including paramyxoviruses and filoviruses), corresponding sera remain archived (and untested) and will be made available for this project to test them using the Luminex-based assay.

University Malaya study of acutely ill Orang Asli patients.
We will also have access to archived and newly collected Orang Asli samples collected from acutely febrile patients at Gombak Hospital that serves the Orang Asli communities, under a separate ongoing disease study at the University of Malaya (Prof. Abu Bakar) and NMRC-A (Co-PI Pike). This study just received renewed funding to continue sampling febrile patients and expand to sample asymptomatic Orang Asli from communities across a land-use gradient, which will include individuals without animal exposure. Under this proposal we will screen sera collected from well characterized Orang Asli patients and community members using the Luminex-based platform.

Key references (Further references are available in the Project Narrative):

Luby, S.P., The pandemic potential of Nipah virus. *Antiviral Research*, 2013. 100(1): p. 38-43.

Olival, K.J. and D.T.S. Hayman, Filoviruses in Bats: Current Knowledge and Future Directions. *Viruses*-Basel, 2014. 6(4): p. 1759-1788.

Sarah I. Jayme, et al., Molecular evidence of Ebola Reston virus infection in Philippine bats. *Virology Journal*, 2015. 12(107): p. 1-8.

Sohayati A. Rahman, et al. Risk Factors for Nipah Virus Infection among Pteropid Bats, Peninsular Malaysia. *Emer. Infect. Dis.,* 2013. DOI: 10.3201/eid1901.120221.

***Tasks/Scientific Goals:* (Format: Year #(s). Task #. Sub-task#)**

Task 1: (Year 1-OY5). Enhance capacity within Malaysia to conduct serological surveillance for henipa- and filoviruses. The GoM has been engaged in using a One-Health approach to zoonotic disease surveillance since the NiV outbreak in 1998 and most recently via collaborations with EHA under PREDICT. However, current GoM and PREDICT surveillance activities in humans, wildlife and domestic animals are based on broad molecular assays designed to identify novel viruses (including henipaviruses and filoviruses). One of the challenges with this approach is that Nipah, Ebola, and related viruses tend to be acute and asymptomatic infections in bats, making detection of viral RNA challenging. IgG antibodies,

however, persist in bats (as well as people and livestock), reducing the sampling effort necessary to identify exposed or infected individuals in a population and also allowing for detection of asymptomatic carriers. Adding a serological component to existing surveillance will greatly enhance the government's ability to detect both known and unknown henipa- and filoviruses in wildlife, domestic animals and human populations at risk for spillover. To establish this capacity, we will provide a BioRad Bio-Plex 200 machine with computer console to NPHL and DWNP. We will provide all reagents for henipa- and filovirus assays. Following Bio-Plex installation, we will conduct a 10-day training course for lab technicians at DWNP and another at NPHL. UM has a Luminex machine and will receive assay reagents and lab staff will participate in one of the training workshops. 1 PhD student at USU will develop additional assay reagents in Y1-OY5. We will identify *either* 1 PhD or 2 Masters' students at UM and 1 PhD student at UPM to train under this project. We will provide additional training to technical staff from GoM partner labs in viral pseudo-type assay development at USU. The grantee shall:

1.1.1. Transfer BioRad Bio-Plex 200 to NPHL and DWNP labs;

1.1.2-2.1.2. Transfer Luminex-based filovirus and henipavirus reagents to DWNP, NPHL, and UM labs; the grantee will provide a BioRad Bio-Plex 200 to UPM and conduct a 10-day training workshop in Y2.

1.1.3.-2.1.3 Train lab staff to use Luminex-based assays

1.1.4- OY5.1.4 Supervise 1 UM PhD or 2 Masters' students (Y1-3), and 1 UPM PhD student

1.1.5-OY5.1.5 Convene the Science Advisory Group (annually in KL);

1.1.6-2.1.6 Develop a database for serology results and sample metadata; establish sample repository at partner labs.

Task 2. (Y1-OY5) Develop and validate Luminex-based reagents to detect henipa- and filovirus antibodies. At USU, we will engineer soluble and secreted versions of henipa- and filovirus glycoproteins, expressed in mammalian cell culture systems to accurately reflect proper synthesis including their assembly and processing into properly glycosylated higher order complexes. Constructs will be designed and tested in pilot experiments for expression and analysis, and then used to establish stably expressing cell lines. Preparative amounts of the various soluble viral glycoproteins will be made using serum-free culture conditions in suspension culture, and proteins are purified using the appropriate tag protocol (either S-tag or double strep tag (TST)) by affinity chromatography, followed by concentration and size exclusion chromatography. We will test the utility of each individual glycoprotein by Luminex, ELISA and Western blotting then provide all necessary reagents to partner labs to accomplish the testing under this project. The grantee shall:

1.2.1-2.2.1 produce Mojaing virus (MojV) and African GH-M74a G glycoproteins; Bundibugyo virus (BDBV), Tai Forest virus (TAFV), Lloviu virus (LLOV), MARV Ravn, SUDV, SUDV GpΔmucin, RESTV (monkey), and RESTV (porcine) Gp glycoproteins.

1.2.2-3.2.2 use the completed viral glycoprotein preparations and produce polyclonal rabbit serum to each individual glycoprotein; test the utility of each individual glycoprotein by Luminex-based, ELISA and Western blotting assays;

1.2.3 Provide N protein reagents to detect novel henipa- and filoviruses to partner labs.

1.2.4-OY5.2.4: If novel henipa- or filoviruses are detected using molecular assays (under

PREDICT), grantee may develop new reagents for antibodies against these viruses and negative sera will be re-screened.

Task 3. Screen archived serum samples from wildlife and Orang Asli for henipa- and filovirus antibodies using a Luminex-based platform (Y1-Y2). Grantee shall test up to 945 macaque and 175 bat archived serum samples collected under PREDICT and stored at DWNP, and up to 300 archived Orang Asli samples stored at NPHL, and up to 200 Orang Asli samples at UM. The number of samples will depend on available serum volume and quality. Results will be used to inform the Orang Asli and farm studies described in **Tasks 4 and 5**. Positive sera may be sent for confirmatory testing at USU using pseudovirus serum neutralization assays, ELISA, or Western blot. Results shall be entered into a database and shared with GoM partners.

1.3.1 Identify suitable archived animal and human sera;
1.3.2 Screen sera for henipa- and filovirus IgG antibodies at GoM and UM partner labs;
1.3.3 Confirm positive results using western blot or pseudovirus assay;
1.3.4 Enter results into database and analyze;
1.3.5-2.3.5 share results with partners.

Task 4. Serological survey of Orang Asli who hunt, wildlife, and peri-domestic animals. (Y1-OY5). Indigenous communities living in forested areas and that practice subsistence wildlife hunting are at higher risk of exposure to zoonotic viruses due to handling and butchering wildlife and therefore contact with bodily fluids. In **Y1** of this project, we will apply for IRB ethical approval to continue and expand from a pilot study currently underway (expected completion: Oct 2016). Pending IRB and IACUC approval, CM, MoH, and DWNP will work together in **Y1-Y2** to sample 100 individuals from each of 3 Orang Asli communities in Perak State (incl. Kuala Lipis and Gua Musang), **totaling 600 human blood samples over five years**. 100 people sampled per community will allow us to detect a seropositive individual with 95% confidence at a prevalence of 3%, assuming a population of 500 individuals. We will also aim to sample blood from 50 bats per each of 3 species around each study village (e.g. *Miniopterus*, *Pteropus*, and *Rousettus* spp); 30 nonhuman primates; and 30 dogs, if present, in order to be able to detect henipa- or filovirus antibodies in an individual with 95% confidence given a 5% seroprevalence (in bats) and 10% in dogs and nonhuman primates. MOH officers and CM will collect blood from Orang Asli and associated animals, and serum will be separated either in the field or at partner labs and stored at -86C at prior to testing. A sample size of 50 bats would allow us to detect differences between study locations (or time points, should we conduct follow-up studies) of 56% with 95% confidence and 80% precision. The grantee shall conduct repeated sampling of Orang Asli and peri-domestic livestock and wildlife in the same communities in Y3-OY4. If novel henipa or filoviruses identified by PREDICT, new assays will be developed in OY4 and negative samples re-tested. Molecular and serological data from Orang Asli will be co-analyzed in OY4-OY5. In addition, we will test sera collected through an ongoing UM study of Orang Asli. Up to 500 samples per year will be collected Y1-OY5, and these will be tested using the Luminex-based platform at UM. Positive samples will be confirmed at UM or USU.
The grantee shall:

1.4.1.-OY5.4.1 Test Orang Asli, wildlife, and peri-domestic animal samples collected under PREDICT and UM studies
1.4.2-2.4.2, Y3.4.2, OY4.4.2-OY5.4.2. Enter results into database and analyze data;
1.4.3 – 2.4.3, Y3.4.3, OY4.4.3 Confirm sero-positive samples;

1.4.4. Develop follow-up study with GoM partners to be implemented in Y3.
2.4.5 Apply for IRB and permits for follow-up study
3.4.6 Implement repeated sampling in Orang Asli villages
3.4.7 Analyze longitudinal data
OY4.4.1. If new viruses found by PREDICT, develop new sero assay and re-test samples
OY4.4.2.-OY5.4.2 Confirm additional test results and co-analyze molecular and sero data

Task 5. Develop serological study of farm workers, livestock, and wildlife around farms. (Y1-OY5) Grantee shall conduct a serological survey of farm workers and animals living on or around 2 large-scale farms (>5000 ruminants and/or pigs) and 2 small-scale farms (500-1000 ruminants and/or pigs) in Peninsular Malaysia to detect exposure to henipa- or filoviruses. Grantee shall work with DWNP to sample bats, macaques and dogs proximal to farms; and with MoH to conduct qualitative research and collect blood samples from farm workers to screen for henipa- and filovirus antibodies. Grantee will work with UPM to sample and test livestock. In Y1 grantee will select appropriately sized farms. Grantee shall also locate bat caves or roosts proximal to each farm, meet farm owners, and characterize the livestock. Grantee shall apply for all necessary IRB and IACUC approvals. Grantee may commence sampling in Y2, pending approvals, and conduct a follow-up study in OY4 and OY5 (if funded). The grantee shall:

1.5.1 Meet with GoM partners to develop study;
1.5.2 Apply for ethical approvals and permits.
1.5.3. Conduct scoping visits to farms, characterize livestock and local wildlife species.
2.5.1-3.5.1 Collect wildlife, livestock, and human samples
2.5.2-3.5.2 Conduct questionnaires with farm workers
2.5.3-3.5.3 Screen samples using Luminex-based assay; confirm results
2.5.4-3.5.4 Enter data into database and analyze results
OY4.5.1-5.5.1 Repeat human, wildlife and livestock sampling at each farm
OY4.5.2-OY5.5.2 Test samples, enter results into database; analyze complete dataset
OY5.5.3 prepare manuscript based on (Y1-OY5) study

Task 6. Disseminate reports to relevant stakeholders (Y1-OY5). Grantee shall synthesize all data collected through the projects described above as well as capacity building activities in Malaysia. Scientific and general reports will be generated and provided to GoM partners and an annual report to DTRA. PhD or Masters' students will complete thesis and present at annual stakeholders meeting in KL or at scientific meeting in Malaysia. Grantee shall meet with GoM partners and SAG in Kuala Lumpur annually, according to schedule. Grantee shall present findings at scientific meetings (e.g. ASTM, ASM Biodefense, IMED, EcoHealth) to present findings according to the schedule.

1.6.1-OY5.6.1 submit progress reports to DTRA.
1.6.2-OY5.6.2 Complete annual report to local stakeholders.
1.6.3-OY5.6.3 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.6.4-OY5.6.4 Conduct annual stakeholder meetings.
3.6.5. Prepare comprehensive project report for GoM
3.6.7, OY5.6.7 UM Graduate students present thesis to committee and prepare publication in peer reviewed journal
3.6.6-OY5.6.6 Prepare and submit publications to disseminate study findings.

Project Timeline

Task	Y1	Y2	Y3	OY4	OY5
1. Enhance capacity in Malaysia for serological surveillance for all henipaviruses and filoviruses					
1.1. Transfer BioRad Bio-Plex 200 in NPHL, DWNP, and UPM labs					
1.2 Transfer serological reagents to NPHL, DWNP, UPM, and UM labs					
1.3 Training staff at partner labs					
1.4 Identify graduate students at UM and UPM					
1.5 Convene Science Advisory Group					
1.6 Develop database for serology results and sample metadata					
1.7 Training in pseudovirus development at USU					
2. Develop & validate henipavirus and filovirus reagents.					
2.1 Produce specific henipavirus and filovirus proteins					
2.2 Produce and test monoclonal antibodies against new proteins					
2.3 Transfer henipa and filo N protein assays to partner labs					
2.4. develop/validate proteins and mAbs for novel henipa- & filoviruses					
3.Screen archived wildlife and Orang Asli sera					
3.1 Identify archived wildlife and human sera at NPHL and DWNP					
3.2 Screen sera using Luminex-based platform					
3.3 Confirm positive sera with additional testing					
3.4 Enter results in database / analyze					
4. Sero-survey of Orang Asli and animals					
4.1 apply for IRB/IACUC approval					
4.2 Collect & test serum samples from Orang Asli ~ animals					
4.3 Enter results into database					
4.4 Confirm positive sera with additional testing					
4.5 Conduct follow-up study of Orang Asli and animals					
4.6 Analyze data					
5. Serological study of farm workers, livestock, and wildlife on farms	■	■	■	■	■
5.1 Apply for necessary permits and ethical approval	■	■			
5.2 scoping visits to potential study farms; select farms	■				
5.3 sample farm workers, livestock, and wildlife on farms		■	■		
5.4 follow-up study of farm workers, wildlife and livestock (4 farms)				■	■
5.5 Enter results into database / analyse results		■	■	■	■
6. Disseminate reports to relevant stakeholders					
6.1 annual report toDTRA					
6.2 annual report to government of Malaysia partners					
6.3 attend DTRA annual technical review					
6.4 partner meeting in Malaysia					
6.5 present results at scientific conference (e.g. ASTMH, IMED, ASM)					
6.6 prepare manuscripts for publication in peer-reviewed journal					

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 9

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00002	24-Mar-2020		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11910033
	X	10B. DATED (SEE ITEM 13) 15-Aug-2019
CODE 3MMU3	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Terms & Conditions, Paragraph 5 Modification of the Grant

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: robinson20960

The purpose of this modification is to:

(1) Combine the scope and value from Option CLINs 0002, 0003, 0004, and 0005 into base CLIN 0001.

(2) Extend the PoP of CLIN 0001 through August 18, 2024 at no addtional cost to the Government.

(3) Update Grant POC.

(4) Update grant funding profile and invoice schedule.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) / CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 24-Mar-2020

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The total cost of this contract was increased by $3,990,550.00 from $998,464.00 to $4,989,014.00.

SECTION B - SUPPLIES OR SERVICES AND PRICES

CLIN 0001

The unit price amount has increased by $3,990,550.00 from $998,464.00 to $4,989,014.00.
The unit of issue Lot has been added.
The total cost of this line item has increased by $3,990,550.00 from $998,464.00 to $4,989,014.00.

CLIN 0002

The CLIN extended description has changed from:

Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics.In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0002 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

The pricing detail quantity has decreased by 1.00 from 1.00 to 0.00.
The total cost of this line item has decreased by $998,181.00 from $998,181.00 to $0.00.

CLIN 0003

The CLIN extended description has changed from:

Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics.In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0003 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

The pricing detail quantity has decreased by 1.00 from 1.00 to 0.00.
The total cost of this line item has decreased by $997,709.00 from $997,709.00 to $0.00.

CLIN 0004
The CLIN extended description has changed from:

Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics.In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0004 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

The pricing detail quantity has decreased by 1.00 from 1.00 to 0.00.
The total cost of this line item has decreased by $997,193.00 from $997,193.00 to $0.00.

CLIN 0005
The CLIN extended description has changed from:

Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics.In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B.

To:

FOR MISSION CONTINUITY, THE SCOPE AND VALUE FROM CLIN 0005 HAS BEEN COMBINED WITH CLIN 0001. THIS OPTION IS NOT TO BE EXERCISED.

The pricing detail quantity has decreased by 1.00 from 1.00 to 0.00.
The total cost of this line item has decreased by $997,467.00 from $997,467.00 to $0.00.

SUBCLIN 000103 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000103					$0.00
	Funding for CLIN 0001 FFP				
				NET AMT	$0.00
	ACRN AC CIN: HDTRA10343770001				$3,990,550.00

SECTION C - DESCRIPTIONS AND SPECIFICATIONS

The following have been modified:

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-14-24-FRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.351

c. **Authority:** 10 U.S.C. 2358 as amended

SECTION E - INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for SUBCLIN 000103:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	N/A

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0001 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 19-AUG-2019 TO 18-AUG-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2019 TO 18-AUG-2024	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0002 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2020 TO 18-AUG-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2020 TO 18-AUG-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0003 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE

POP 19-AUG-2021 TO 18-AUG-2022	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2021 TO 18-AUG-2022	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0004 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2022 TO 18-AUG-2023	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2022 TO 18-AUG-2023	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

The following Delivery Schedule item for CLIN 0005 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2023 TO 18-AUG-2024	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
POP 19-AUG-2023 TO 18-AUG-2024	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $3,990,550.00 from $998,437.00 to $4,988,987.00.

SUBCLIN 000103:
Funding on SUBCLIN 000103 is initiated as follows:

ACRN: AC

CIN: HDTRA10343770001

Acctng Data: 044315 097 0134 000 N 20202022 D 3400 0901515BR_KD_BP_TB_20 2022_0134_3400_SCNCT DTRA 410

Increase: $3,990,550.00

Total: $3,990,550.00

The following have been modified:

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:
The amount of $4,989,014 is obligated for work to be performed during the period beginning with grant award and continuing through August 18, 2024.

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE

1	9/19/2019	$83,205.33
2	10/19/2019	$83,205.33
3	11/19/2019	$83,205.33
4	12/19/2019	$83,205.33
5	1/19/2020	$83,205.33
6	2/19/2020	$83,205.33
7	3/19/2020	$83,205.33
8	4/19/2020	$83,205.33
9	5/19/2020	$83,205.34
10	6/19/2020	$83,205.34
11	7/19/2020	$83,205.34
12	8/19/2020	$83,205.34
13	9/19/2020	$83,181.75
14	10/19/2020	$83,181.75
15	11/19/2020	$83,181.75
16	12/19/2020	$83,181.75
17	1/19/2021	$83,181.75
18	2/19/2021	$83,181.75
19	3/19/2021	$83,181.75
20	4/19/2021	$83,181.75
21	5/19/2021	$83,181.75
22	6/19/2021	$83,181.75
23	7/19/2021	$83,181.75
24	8/19/2021	$83,181.75
25	9/19/2021	$83,142.42
26	10/19/2021	$83,142.42
27	11/19/2021	$83,142.42
28	12/19/2021	$83,142.42
29	1/19/2022	$83,142.42
30	2/19/2022	$83,142.42
31	3/19/2022	$83,142.42
32	4/19/2022	$83,142.42
33	5/19/2022	$83,142.41
34	6/19/2022	$83,142.41
35	7/19/2022	$83,142.41
36	8/19/2022	$83,142.41
37	9/19/2022	$83,099.42
38	10/19/2022	$83,099.42
39	11/19/2022	$83,099.42
40	12/19/2022	$83,099.42
41	1/19/2023	$83,099.42
42	2/19/2023	$83,099.42
43	3/19/2023	$83,099.42
44	4/19/2023	$83,099.42

45	5/19/2023	$83,099.41
46	6/19/2023	$83,099.41
47	7/19/2023	$83,099.41
48	8/19/2023	$83,099.41
49	9/19/2023	$83,122.25
50	10/19/2023	$83,122.25
51	11/19/2023	$83,122.25
52	12/19/2023	$83,122.25
53	1/19/2024	$83,122.25
54	2/19/2024	$83,122.25
55	3/19/2024	$83,122.25
56	4/19/2024	$83,122.25
57	5/19/2024	$83,122.25
58	6/19/2024	$83,122.25
59	7/19/2024	$83,122.25
60	8/19/2024	$83,122.25

(End of Summary of Changes)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
P00001	27-Nov-2019		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		9A. AMENDMENT OF SOLICITATION NO.
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. HDTRA11910033
CODE 3MMU3 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 15-Aug-2019

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

See Schedule

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
DTRA Terms and Conditions section 5

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: lyles20269
Incremental funding of $436.10

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) (b)(6) CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer)	16C. DATE SIGNED 27-Nov-2019

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $436.10 from $998,000.90 to $998,437.00.

SUBCLIN 000102:

AB: 044315 097 0134 000 N 20192021 D 3400 0901515BR_KD_BP_TB_19 1921_0134_3400_SCNCT DTRA 410 (CIN HDTRA19312200001) was increased by $436.10 from $996,413.90 to $996,850.00

The following have been modified:

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/AL-ACC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email addr

b. Grantee Business Office:
Name: Dr. Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. William Karesh
Title: Executive Vice President of Health and Policy
Phone: (212) 380-4463
E-mail: karesh@ecohealthalliance.org

(End of Summary of Changes)

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 12

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA11910033	15 Aug 2019	

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182317 COLUMBUS OH 43218-2317	HQ0337

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	See Schedule

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				
				15G. TOTAL AMOUNT OF CONTRACT	**$998,464.00**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM	1		I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 5			**PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.**	
X	C	DESCRIPTION/ SPECS./ WORK STATEMENT	6	X	J	LIST OF ATTACHMENTS	12
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	7		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	8				
X	G	CONTRACT ADMINISTRATION DATA	9 - 11		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] SEALED-BID AWARD (Contractor is not required to sign this document.)
Your bid on Solicitation Number _____
including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the terms listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTING OFFICER TEL.: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	15-Aug-2019

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1		$998,464.00	$998,464.00

YEAR 1: FRBAA14-6-2-0333
FFP
Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics.

In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B.
FOB: Destination

NET AMT $998,464.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Funding for CLIN 0001
FFP

NET AMT $0.00

ACRN AA $1,587.00
CIN: HDTRA19314590001

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000102					$0.00
	Funding for CLIN 0001 FFP				
				NET AMT	$0.00
	ACRN AB CIN: HDTRA19312200001				$996,413.90

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002 OPTION	YEAR 2: FRBAA14-6-2-0333 FFP Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics. In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B. FOB: Destination	1		$998,181.00	$998,181.00
				NET AMT	$998,181.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		1		$997,709.00	$997,709.00
OPTION	YEAR 3: FRBAA14-6-2-0333 FFP Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics. In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B. FOB: Destination				
				NET AMT	$997,709.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		1		$997,193.00	$997,193.00
OPTION	YEAR 4: FRBAA14-6-2-0333 FFP Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics. In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B. FOB: Destination				
				NET AMT	$997,193.00

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1		$997,467.00	$997,467.00
OPTION	YEAR 5: FRBAA14-6-2-0333 FFP Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology, and Socio-Economics. In accordance with the following attachments: SOW at Exhibit A dated December 5,2018 and DTRA Terms and Conditions for Grant Awards, dated April 6, 2018 at Exhibit B. FOB: Destination				
				NET AMT	$997,467.00

Section C - Descriptions and Specifications

CLAUSES INCORPORATED BY FULL TEXT

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-14-24-FRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.531

c. **Authority:** 10 U.S.C. 2358 as amended

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A
0002	Destination	Government	Destination	Government
0003	Destination	Government	Destination	Government
0004	Destination	Government	Destination	Government
0005	Destination	Government	Destination	Government

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
0001	POP 19-AUG-2019 TO 18-AUG-2020	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A
0002	POP 19-AUG-2020 TO 18-AUG-2021	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
0003	POP 19-AUG-2021 TO 18-AUG-2022	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1
0004	POP 19-AUG-2022 TO 18-AUG-2023	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1
0005	POP 19-AUG-2023 TO 18-AUG-2024	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20182020 D 34HQ 0901515BR_KD_BP_OT_18 1820_0134_34HQ_SCNCT DTRA 410
AMOUNT: $1,587.00

AB: 044315 097 0134 000 N 20192021 D 3400 0901515BR_KD_BP_TB_19 1921_0134_3400_SCNCT DTRA 410
AMOUNT: $996,413.90

ACRN	CLIN/SLIN	CIN	AMOUNT
AA	000101	HDTRA19314590001	$1,587.00
AB	000102	HDTRA19312200001	$996,413.90

CLAUSES INCORPORATED BY REFERENCE

252.232-7007 Limitation Of Government's Obligation APR 2014

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

d. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/AL-ACC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email add

e. Grantee Business Office:
Name: Dr. Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

f. Grantee Principal Investigator (PI):
Name: Dr. William Karesh
Title: Executive Vice President of Health and Policy
Phone: (212) 380-4463
E-mail: karesh@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

g. Grants Officer's Representative (GOR) for this Grant is:

Name: (b)(6)
Defense Threat Reduction Agency/BTRP
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email add

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

252.632-9000 GRANT FUNDING PROFILE (MAR 2012)

FUNDING PROFILE:
The amount of $998,000.90 is obligated for work to be performed during the period beginning with grant award and continuing through August 18, 2020. Additional incremental funding planned, but not obligated, is:

FY19 $463.10

The Government's liability is limited to the amount obligated.

INVOICE SCHEDULE

1	9/19/2019	$83,205.33
2	10/19/2019	$83,205.33
3	11/19/2019	$83,205.33
4	12/19/2019	$83,205.33
5	1/19/2020	$83,205.33
6	2/19/2020	$83,205.33
7	3/19/2020	$83,205.33
8	4/19/2020	$83,205.33
9	5/19/2020	$83,205.34
10	6/19/2020	$83,205.34
11	7/19/2020	$83,205.34
12	8/19/2020	$83,205.34

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Exhibit A	Statement of Work	6	05-DEC-2018
Exhibit B	DTRA Terms and Conditions	18	06-APR-2018

DEFENSE THREAT REDUCTION AGENCY (DTRA)
GENERAL TERMS AND CONDITIONS FOR GRANT AWARDS

Table of Contents

1. **Terms and Conditions Incorporated by Reference.**

   The DoD Research and Development General Terms and Conditions, dated July 2016, are hereby incorporated by reference and are available for download at website http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions.aspx.

2. **Acceptance of Grant.**

   The recipient is not required to countersign the Grant document; however, the recipient agrees to the conditions specified in the Research Grant and the Articles contained herein unless notice of disagreement is furnished to the Grants Officer within fifteen (15) calendar days after the date of the Grants Officer's signature. In case of disagreement, the recipient shall not assess the Grant any costs of the research unless and until such disagreement(s) is resolved.

3. **Recipient Responsibilities.**

   The recipient will bear primary responsibility for the conduct of the research and will exercise judgment towards attaining the stated research objectives within the limits of the Grant's Terms and Conditions.

   The Principal Investigator(s) (PI) specified in the Grant award will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The PI, operating within the policies of the recipient, is in the best position to determine the means by which the research may be conducted most effectively.

4. **Standards for Financial Management Systems.**

   Where the Federal Government guarantees or insures the repayment of money borrowed by the recipient, DTRA, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the recipient are not deemed adequate to protect the interest of the Federal Government.

   DTRA may require adequate fidelity bond coverage where the recipient lacks sufficient coverage to protect the Federal Government's interest.

   Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties, as prescribed in 31 CFR Part 223, "Surety Companies Doing Business with the United States."

5. **Modification of the Grant.**

   The only method by which this Grant may be modified is by a formal, written modification signed by the Grants Officer. No other communications, whether oral or in writing, are valid.

   Prior Approvals are required as follows:

   1) Expenditures on equipment costing $5,000 or more not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)
   2) Expenditures for foreign travel not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)

3) Prior approval is not required to transfer amounts budgeted for indirect costs to absorb increases in direct costs, or vice versa.
4) Prior approval is not required to carry forward an unobligated balance to a subsequent period of performance under this award.

6. Payments.

The 2 CFR 200 governs responsibilities concerning payments, with the following clarifications:

Recipients shall submit requests for payment using Invoicing, Receipt, Acceptance, and Property Transfer (iRAPT) at https://wawf.eb.mil/. Any request for advance payments must be approved by the Administrative Grants Office shown in Block 6 of the award. The request shall be submitted to the Administrative Office identified in Block 6 of the Research Grant by entering the following routing codes:

1) *Pay Office DoDAAC*: See Block 12 (Code) on the first page of the Grant.
2) *Invoice Type*: Grant and Cooperative Agreement Voucher.
3) *Issue By DoDAAC*: See Block 5 (Code) on the first page of the Grant.
4) *Admin DoDAAC*: See Block 6 (Code) on the first page of the Grant.
5) *Grant Approver*: Same as Admin DoDAAC (Leave Ext. blank).

Payments will be made by the Defense Finance and Accounting Service (DFAS) office specified in the Research Grant (Block 12).

A foreign awardee must have a U.S. bank account and be signed up for electronic payments (electronic funds transfers (EFT)).

7. Funding Increments and/or Options.

The recipient is advised that the Grantor's obligation to provide funding for increments and/or options included in the Grant is contingent upon satisfactory performance in the judgment of the DTRA Scientific Officer/Technical Monitor and the availability of funds. Other factors will be considered before options will be exercised (for example, expenditure rate and current programmatic objectives). Accordingly, no legal liability on the part of the Grantor exists unless or until funds are made available to the Grantor and notice of such availability is confirmed in writing to the recipient. Refer to the Funding Profile in Section G of the Grant for additional incremental funding planned, but not currently obligated for the Grant.

Funding Increments – In no event is the Government obligated to reimburse the recipient for expenditures in excess of the total funds allotted by the Government to this agreement. Recipients should note that low expenditure rates reported on payment requests may be cause for deferral of future increments. The Government anticipates unilateral modifications for funding increments.

Options – If the agreement contains Option(s), the Government reserves the right to exercise the Option(s) unilaterally.

8. Patent Rights.

Patent Rights are governed by 37 CFR 401.14 with the following clarifications: All DTRA-related disclosures, confirmatory licenses to the government, patent applications, and other communications should be submitted as detailed herein.

The 37 CFR Part 401 invention reporting requirements are summarized in the table below. Unless otherwise indicated in the "Submission to DTRA" column, the grantee is required to upload the following types of invention information using iEdison (https://s-edison.info.nih.gov/iEdison/), a single web interface for government grantees to report details of inventions and patents. If the grantee organization is not already an iEdison registrant, then iEdison registration is required prior to submission of the below invention reports. The grant shall not be closed out until all invention reporting requirements are met.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Invention Report: The grantee must submit a report of any "subject" invention. The report must identify inventor(s), federal agency(ies), grant number(s), and date of any public disclosure. Date of submission establishes time frames for all future actions. Must be complete in technical detail. The report should be directed to the lead agency.	Within 2 months of inventor's initial report to the grantee contractor organization.	There is no single format for disclosing the invention to the government. The communication should include the title of the invention, date of any public disclosure, names of all inventors, source(s) of federal funding (i.e. grant number), a written description of the invention in technical detail. The invention disclosure should be signed by the inventor(s); at the very least signed by a grantee institutional official.	401.14(a)(2) 401.14(c)(1)	Submit electronically by uploading either a PDF, TIFF, or text file through iEdison.
Rights to Inventions on Subcontracts: Subcontractors retain rights to their subject inventions.	Same reporting responsibilities, obligations and time frames as prime grantee organization.	Prime grantee organization cannot require ownership of subcontractor's subject invention(s).	401.14(g)(1) 401.14(g)(2)	Invention disclosure, confirmatory license, and proof of gov't support clause shall be submitted electronically through iEdison.
Election of Title to Invention: Grantee organization must notify the federal agency sponsor that it will retain ownership of invention and take steps to commercialize the invention.	Within 2 years of reporting the invention to the lead federal agency sponsor. (If disclosed publicly, this period is decreased.)		401.14(b) 401.14(f)(1) 401.14(c)(2)	Submit electronically through iEdison.
Confirmatory license The grantee organization must provide a nonexclusive, nontransferable, irrevocable, paid-up license for the government to practice or have the invention practiced on its behalf throughout the world.	Commensurate with report of any initial patent filing, unless the invention is being licensed as an unpatented biological material or research tool.		401.14(f)(1)	Submit electronically by uploading either a PDF or TIFF file through iEdison.
Nonelection of Title to Invention: Grantee organization must notify the federal sponsor that it will not retain ownership of an invention.	Within 2 years of reporting to federal agency sponsor. (If disclosed publicly, this period is decreased.)	Effectively a waiver to the government. After further review the federal agency sponsor may elect title on behalf of the government. Title does not actually vest with the government until government elects to retain title.	401.14(c)(2) 401.14(d)	Submit electronically through iEdison.
Assignment of Invention Rights to the Inventor: The inventor may request assignment of invention rights. Agencies support requests of this type to variously. In all cases, documentation is required when a grantee organization waives rights to the invention and the inventor(s) wishes to retain the invention rights.	At the time the grantee organization elects not to pursue title and the inventor requests rights in the invention.	First, the grantee organization must elect not to retain rights in the invention. Second, the inventor must request the assignment of rights, agree to all terms associated with invention reporting as detailed in 37 CFR 401, and must pursue commercialization of the invention through patent filing or licensing as a research tool. Specific procedures for any agency should be determined prior to initiating the request.	401.14(k)(1) non-profits	This status shall be indicated using iEdison. Submission of all other issues (such as outstanding required documents) should be resolved prior to proceeding further. Submission of the required documents will be done electronically by uploading either a PDF, TIFF, or text file through iEdison.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Initial Patent Application: The grantee must inform the government of the initial patent application that related to any subject invention. The patent application must include a government support clause.	Within 1 year after election of title, unless there is an extension.	Time frame may vary if invention becomes public. The term initial patent application means a nonprovisional U.S. national application for patent as defined in 37 CFR 1.9(a)(3). The notification must include the patent application number and filing date assigned by the USPTO. A copy of the full application is not required.	401.14(e)(3) 401.2(n)	All filing data shall be submitted via iEdison. Evidence of inclusion of government support clause shall be submitted electronically as either a PDF or TIFF file through iEdison.
Assignment to Third Party: Documentation necessary when a grantee contractor wishes to assign invention rights to third party. If the grantee contractor is a non-profit, the government must approve the assignment. For profit or small business grantee contractors do not need to seek approval. If the rights are assigned, new rights holder assumes the same reporting responsibilities as the grantee contractor organization.		If assignment approved, third party must pursue commercialization of the invention through patent filing or licensing of the invention as a research tool. Specific procedures to request third party assignment may vary between agencies. Consult DTRA prior to initiating request	401.14(k) for non-profits Note the distinction between small businesses and non-profit organizations.	Documentation shall be submitted electronically as either a PDF or TIFF file through iEdison.
Issued Patent: Grantee must provide federal agency sponsor with patent issue date, number, title of patent, and evidence of government support clause.	At the time of issue	Patent must include government support clause	401.5(f)(2) 401.14(f)(4)	All issued patent information shall be provided using iEdison. Evidence of inclusion of government support clause will be provided electronically as a PDF or TIFF file through iEdison.
Request for Extension of Time: An extension of up to two years may be requested for election of title, or one year for filing a patent application.	Prior to any statutory bar	Extension of 2 years for title election and one year for patent application are preapproved for funded inventions. Additional extensions need written approval from the federal agency sponsor.	401.14(e)(4)	Request electronically using iEdison.
Discontinuance of Patent Application, Payment of Maintenance Fees, or Defense in a Reexamination or Opposition proceeding on a Patent: Grantee must notify federal agency sponsor of changes in patent status.	At any time in the process, but prior to established deadlines	Relevant information and documents (e.g., patent application or patent) must be provided such that a determination to protect government interests can be made. The federal agency sponsor has the option to pursue the patent application or the patent if not being properly pursued or maintained. Any change in status must be reported at least 30 days prior to pending PTO office actions.	401.14(f)(3) 401.6	Indication shall be made via iEdison.

Action	When	Discussion	37 CFR Reference	Submission to DTRA
Annual Utilization Report: DTRA requires utilization reporting for all subject inventions that have had title elected or are licensed without a patent. Report includes stage of development, date of first commercial sale or use, number and type of licenses, gross income, licensing to small business, status of U.S. manufacturing and identification of any FDA-approved product names.	Annually	DTRA requires invention utilization reports on a 12 month reporting cycle beginning in the month of grantee choosing and continuing throughout duration of patent. Information requirements defined in iEdison. Note: this reporting requirement, if applicable, extends beyond the grant period.	401.14(h)	Submit electronically using iEdison.
Annual Summary Report of Inventions: Summarize all previously reported subject inventions under this grant.	Annually	Invention reports shall be filed annually due no later than 1 July of each year. Grants effective after 31 January will not require a report until 1 July of the following year. The recipient shall use DD Form 882, Report of Inventions and Subcontracts, to file invention reports. If no inventions occurred during the annual reporting period a negative report must be submitted --Email Form DD882 to dtrabas:cresearch:@mail.mil (file size must be less than 10MB). File should be named by the Grant number and "Invention Report" (e.g. HDTRA1-12-1-9999 Invention Report). --The Grant shall not be closed out until all invention reporting requirements are met.	401.5(f)(3)	No iEdison submission allowed. Submit DD Form 882, Report of Inventions and Subcontracts to: --DTRA Grants Officer, 8725 John J. Kingman Rd., MSC 6201 (#2730B), Ft. Belvoir VA 22060-6201 --Administrative Office identified in the Grant --As directed by DTRA, email or portal.
Final Invention Statement and Certification: Report all subject inventions derived or reduced to practice during the performance of the grant.	Due with the Final Technical Report within 90 days after the project ends	Invention reports shall be filed at the end of the Grant's PoP. If no inventions occurred during the lifetime of the award, a negative report must be submitted. --Email Form DD882 to dtrabas:cresearch:@mail.mil (file size must be less than 10MB). File should be named by the Grant number and "Invention Report" (e.g. HDTRA1-12-1-9999 Invention Report). --The Grant shall not be closed out until all invention reporting requirements are met.	401.5(f)(1)	No iEdison submission allowed. Submit DD Form 882, Report of Inventions and Subcontracts to: --DTRA Grants Officer, 8725 John J. Kingman Rd., MSC 6201 (#2730B), Ft. Belvoir VA 22060-6201 --Administrative Office identified in the Grant --As directed by DTRA, email or portal.

9. **<u>Technical Reporting Requirements</u>.**

Research Performance Progress Report (RPPR). Except under rare cases, RPPRs are required annually. The RPPR is due no later than 1 July of each year. Grants effective after 31 January will not require a RPPR until 1 July of the following year.

The RPPR is *not* a cumulative report. The first RPPR shall <u>only</u> include actions that occurred from the Period of Performance start date up to submission of the first RPPR. Each subsequent report shall only include actions that occurred during the 12-month period following the previous year's RPPR.

A RPPR is not required in the final year of the award if the period of performance ends within 60 days of the RPPR due date. In this instance the Final Report will satisfy the requirement. Broadly the RPPR shall address the following items:

- Accomplishments
- Products
- Participants and Other Collaborating Organizations
- Impact
- Changes/Problems

Templates and specific instructions will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). A copy of the RPPR should also be provided to the Administrative Office identified in the Grant. The file names should be as follows:

- RPPR: Year Annual Report Grant Number, e.g. 2017 Annual Report HDTRA1-12-1-9999.
- Metrics: Year Metrics Grant Number, e.g. 2017 Metrics HDTRA1-12-1-9999.

Quad Chart. An updated quad chart must be submitted annually. A template will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). The file name should be as follows:

- Quad Chart: Year Quad Chart Grant Number, e.g. 2017 Quad Chart HDTRA1-12-1-9999.

Annual Technical Review. At least one representative (preferably the PI) for each award is expected to attend and present at an annual technical program review meeting, unless otherwise exempted by DTRA in writing. For planning purposes reviews will typically be for two days in Northern Virginia during the spring or summer months.

Final Technical Report. A comprehensive final technical report is required: the draft document is required forty-five (45) days prior to the end of the Period of Performance and the final document is required ninety (90) days after the expiration or termination of the award.

The purpose of the final report is to document and to transition the results of the effort into the DTRA and DoD applied research community. The final report will always be sent to the Defense Technical Information Center (DTIC) and unclassified reports may be made available to the public through the National Technical Information Service (NTIS).

The final report is more than an extension of previous annual reports. The final report shall be a **comprehensive** technical summary of the significant work accomplished. The final report, where it is not readily accessible in published form should, where applicable:

- Clearly describe and illustrate the experimental equipment, setup, and procedures;
- Characterize and tabulate collected/computed data in an appendix;

- Sufficiently describe computational codes so they can be reproduced. Include a listing of the code in an appendix if possible and appropriate; and
- When the research effort culminates in the production of one or more student theses or dissertations, in these cases, the most significant advancements and conclusions (equations, figures, relationships, etc.) should be included in an executive summary. The theses or dissertations should be attached as appendices only if they are not readily available. If they are, clearly reference them and how they can be obtained. Also include in the executive summary, cumulative lists of people involved in, and publications stemming from, the research effort. Do not include copies of already submitted or published articles in the final report.

Standard Form (SF) 298, Report Documentation Page, must be used. Item 13 of the SF-298 should contain a 100 to 200 word abstract summarizing technical progress during the reporting period. The SF-298 may be found on the Internet at: http://www.gsa.gov/portal/forms/download/116146

All of the report pages should be prepared for acquisition and distribution by DTIC. All of the report pages should be of good quality for copying purposes. No pages should be missing.

The format and standard required by your institution for the preparation of theses and dissertations shall be used for the final report. In the absence of any institutional standards, you may wish to refer to the American National Standards Institute (ANSI) document Z39.18-1987, "Scientific and Technical Reports: Organization, Preparation, and Production," for guidance. The report may be obtained from:

American National Standards Institute, Inc.
1430 Broadway
New York, NY 10018

It is anticipated that all final technical reports will be unclassified and that distribution will not be limited. However, for final technical reports that require a limited distribution as deemed necessary by DTRA, a Distribution List will be provided with the comments on the draft final technical report. The Distribution List should be formatted to match the rest of the report, placed at the end of the report, and added to the Table of Contents. The number of pages in the Distribution List should be added to the total page count and included in the total number of pages cited in Block 15 of the SF-298.

The draft of the final technical report will be due not later than forty-five (45) days prior to the end of the period of performance. The draft of the final technical report (including a draft SF-298) must be submitted electronically as follows:

- Email the draft of the final technical report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Draft Final Report' and the Grant number, e.g. Draft Final Report HDTRA1-12-1-9999.
- Provide a copy of the report to the Administrative Office identified in the Grant.

Within thirty (30) days, this draft will be reviewed by DTRA and comments will be provided to the Grantee to ensure the report complies with DTRA final report requirements. Such review and comment does not restrict the conduct or reporting of the project research

findings/outcomes and, in accordance with Article 35, does not restrict Grantee's ability to publish. Grantee shall incorporate such requested changes so that the report incorporates and complies with agreement final reporting requirements terms. Final Technical Reports are due ninety (90) days after the expiration or termination of the award. The final submission should be made in accordance with the draft final report submission instructions.

Final Metrics. A final metrics table (in MS Excel format) is required. A template and specific instructions will be provided in advance of the submission deadline. The final metrics file should be submitted along with the Final Technical Report. The fields contained in the final metrics file are analogous to those of the annual submissions. The final metrics file shall contain only data from the last annual reporting period until the end of the award's funded Period of Performance.

- Email the final Metrics File to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Final Metrics' and the Grant number, e.g. Final Metrics HDTRA1-12-1-9999.

10. Financial Reporting Requirements.

Federal Financial Reports (SF-425) are due no later than 1 July of each year with data "as of" 30 May of that year. Grants effective after 31 January will not require a Federal Financial Report until 1 July of the following year. All financial reports shall be submitted to the Administration Office identified in Block 6 of the Research Grant. In addition, the Federal Financial Report must be submitted electronically as follows:

- Email the Federal Financial Report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be the Year, 'Federal Financial Report' and the Grant number, e.g. 2015 Federal Financial Report HDTRA1-12-1-9999.

11. Delegation of Administration Duties.

Certain grant administration duties have been delegated to the Administration Office identified in Block 6 of the Research Grant. These duties are as follows:

1) Provisionally approve all Grant and Cooperative Agreement Vouchers.
2) Perform all property administration services except the approval of recipient's requests to purchase equipment with grant funds. Such approvals must be granted by the DTRA Grants Officer.
3) Perform all plant clearance functions.
4) Approve requests for Registration for Scientific and Technical Information Services (DD Form 1540).
5) Obtain all financial report(s) (see Article 10 of this document).
6) Execute administrative closeout procedures, which include the following:
   a. Obtain the final Report of Inventions and Subcontracts (DD Form 882).
   b. Obtain final payment request, if any.
   c. Obtain final property report and dispose of purchased property and government furnished equipment (GFE) in accordance with the DoDGARs Part 22, Subpart G.
   d. Perform a review of final incurred costs and assist the Grants Officer in resolving exceptions, if any, resulting from questioned costs.
   e. Assure that all refunds due the Government are received by the Grantor.

NOTE: This term and condition is **not applicable** to instrumentation and equipment grant awards.

12. Security.

As a general rule, PI's will not need access to classified security information in the conduct of research supported under this Grant. Should it appear that access to such information is desirable the recipient shall advise the Grantor and request clearance for the investigator. Should information be developed during the course of work under this Grant that, in the judgment of the PI or the recipient, should be classified, the Grants Officer shall be notified immediately.

13. Representations and Assurances.

By accepting funds under this Grant, the recipient assures that it will comply with applicable provisions of the national policies and statutory/regulatory/executive-based requirements detailed below.

LIVE ORGANISMS. By signing this agreement or accepting funds under this agreement, the recipient assures that it will comply with applicable provisions of the following national policies concerning live organisms:

1) For human subjects:

   a) Adhere to the requirements for protection of human subjects per the DoD level terms and conditions as well as the following DTRA requirements:
   b) The recipient shall adhere to DTRA local clause 252.223-9002 – Protection of Human Subjects (Aug 2010). The full text of this clause is as follows:

      All research under this grant involving human subjects must be conducted in accordance with 32 CFR 219, 10 U.S.C 980, and DoDD 3216.02, as well as other applicable federal and state regulations. Grantees must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as regards vulnerable populations (32 CFR 219 modifications to subparts B-D of 45 CFR 46), recruitment of military research subjects (32 CFR 219), and surrogate consent (10 U.S.C. 980).

      DTRA Directive 3216.01 of June 9, 2010 establishes the DTRA Human Subjects Protection Program, sets forth the policies, defines the applicable terms, and delineates the procedures necessary to ensure DTRA compliance with federal and DoD regulations and legislation governing human subject research. The regulations mandate that all DoD activities, components, and agencies protect the rights and welfare of human subjects of study in DoD-supported research, development, test and evaluation, and related activities hereafter referred to as "research". The requirement to comply with the regulations applies to new starts and to continuing research.

      The DTRA directive requires that research using human subjects may not begin or continue until the Defense Threat Reduction Agency's Research Oversight Board (ROB) has reviewed and approved the proposed protocol. Grantees and subcontractors are required to submit a valid federal assurance for their organization

(institution, laboratory, facility) that has been issued by either DoD or the Department of Health and Human Services, and documentation of review of proposed protocols by the local Institutional Review Board (IRB) to include consent forms for any planned research using human subjects to the DTRA ROB for its review through the Grants Officer's representative (if assigned) or the Grants Officer. The ROB review is separate from, and in addition to, local IRB review.

A study is considered to involve human research subjects if: 1) there is interaction with the subject (simply talking to the subject qualifies; no needles are required); and 2) if the study involves collection and/or analysis of personal/private information about an individual, or if material used in the study contains links to such information.

Written approval to begin research or subcontract for the use of human subjects under the proposed protocol will be provided in writing from the DTRA ROB, through the Grants Officer. A copy of this approval shall be maintained by both the Grantee and the government. Any proposed modifications or amendments to the approved protocol or consent forms must be submitted to the local IRB and the DTRA ROB for review and approval. Examples of modifications/ amendments to the protocol include but are not limited to:

- a change of the PI;
- changes in duration or intensity of exposure to some stimulus or agent;
- changes in the information requested of volunteers, or changes to the use of specimens or data collected; or
- changes in perceived or measured risks or benefits to volunteers that require changes to the study.

Research pursuant to such modifications or amendments shall not be initiated without IRB and ROB approval except when necessary to eliminate apparent and immediate hazards to the subject(s).

Research projects lasting more than one year require IRB review at least annually, or more frequently as required by the responsible IRB. ROB review and approval is required annually. The Grantee or subcontractor must provide documentation of continued IRB review of protocols for ROB review and approval in accordance with these Terms and Conditions. Research must not continue without renewed ROB approval unless necessary to eliminate apparent and immediate hazards to the subject(s).

Non-compliance with any provision of this clause may result in withholding of payments under the grant pursuant to the grant's payments clause(s) and/or grant termination pursuant to the grant's termination clause(s). The government shall not be responsible for any costs incurred for research involving human subjects prior to protocol approval by the ROB.

2) For animals:

   a. Adhere to the requirements for protection of animal subjects per the DoD level terms and conditions as well as the following DTRA requirements:

b. DTRA local clause 252.235-9001 – Prohibition of Use of Laboratory Animals (Jul 2010). The full text of this clause is as follows:

The grant recipient shall obtain approval from the US Army Medical Research and Material Command (MRMC), Animal Care and Use Review Office (ACURO) prior to conducting research on live nonhuman vertebrates. Studies involving non-human primates, dogs, cats, or marine mammals will require a site visit by an ACURO laboratory animal veterinarian as a condition of approval. DoD may also conduct site visits involving research on other animals when deemed appropriate. The animal research facility is responsible for notifying the DoD sponsor if Association for the Assessment and Accreditation of Laboratory Animal Care accreditation is lost or the facility is under USDA inspection. DoD also has the right to a site inspection under these circumstances.

The grant recipient (including subcontractors) is expressly forbidden to use laboratory animals in any manner whatsoever without the express written approval of MRMC ACURO.

The grant recipient shall complete the ACURO Animal Use Appendix for Research Involving Animals found at the following web site: http://mrmc.amedd.army.mil/index.cfm?pageid=research_protections.acuro_animalappendix. Submit the completed ACURO appendix, contact information, the DTRA grant number and a copy of the grant for processing to the email address listed at the ACURO website. Once ACURO approves the effort, the grant recipient will receive written approval to begin animal use from the US Army MRMC ACURO by separate email. The grant recipient shall promptly provide a copy of the approval to the Grants Officer and Grants Officer representative. After approval, changes or protocol amendments must be submitted to and approved by ACURO before implementation.

The grant recipient, or subcontractors as appropriate, shall submit the most recent U.S. Department of Agriculture Animal Care Inspection Report annually in accordance with instructions provided.

Non-compliance with any provision of this clause may result in termination of the grant.

DoD Instruction 3216.01, dated September 13, 2010, provides policy and requirements for the use of animals in DoD-funded research based on Army Regulation 40-33. The DoD definition of animal is any live nonhuman vertebrate. All proposals that involve the use of animals must be in compliance with DoD Instruction 3216.01 and AR 40-33. DTRA requires that research using animals not begin or continue until the ACURO has reviewed and approved the proposed animal use. For animals, the provisions include rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Action of 1966 (U.S.C. 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23

RESEARCH INVOLVING RECOMBINANT DNA MOLECULES. Any recipient performing research involving recombinant DNA molecules and/or organisms and viruses

containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," July 5, 1994 (59 FR34496) amended August 5, 1994 (59 FR40170) amended April 27, 1995 (60 FR 20726), or such later revision of those guidelines as may be published in the Federal Register.

COMBATING TRAFFICKING IN PERSONS. The recipient agrees to comply with the trafficking in persons requirement in Section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)) as implemented by 2 CFR 175.

1) Provisions applicable to a recipient that is a private entity.

   a. You as the recipient, your employees, sub-recipients under this award, and sub-recipients' employees may not—
      - Engage in severe forms of trafficking in persons during the period of time that the award is in effect;
      - Procure a commercial sex act during the period of time that the award is in effect; or
      - Use forced labor in the performance of the award or subawards under the award.

   b. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a sub-recipient that is a private entity—
      - Is determined to have violated a prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph 1)a. of this award term through conduct that is either—
        - Associated with performance under this award; or
        - Imputed to you or the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

2) Provision applicable to a recipient other than a private entity.

   a. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a sub-recipient that is a private entity—
      - Is determined to have violated an applicable prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph 1)a. of this award term through conduct that is either—
        - Associated with performance under this award; or
        - Imputed to the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide

Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

3) Provisions applicable to any recipient.

   a. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph 1)a. of this award term.

   b. Our right to terminate unilaterally that is described in paragraph 1)b. or 2)a. of this Article:
      - Implements Section 106(g) of the TVPA, as amended (22 U.S.C. 7104(g)), and
      - Is in addition to all other remedies for noncompliance that are available to us under this award.

   c. You must include the requirements of paragraph 1)a. of this award term in any subaward you make to a private entity.

4) Definitions. For purposes of this award term:

   a. "Employee" means either:
      - An individual employed by you or a sub-recipient who is engaged in the performance of the project or program under this award; or
      - Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

   b. "Forced labor" means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

   c. "Private entity":
      - Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.
      - Includes:
        - A non-profit organization, including any non-profit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
        - A for-profit organization.

   d. "Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at Section 103 of the TVPA, as amended (22 U.S.C. 7102).

PROHIBITION ON USING FUNDS UNDER GRANTS AND COOPERATIVE AGREEMENTS WITH ENTITIES THAT REQUIRE CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS. The recipient agrees to comply with the requirements in section 743 of the Financial Services and General Government Appropriations Act, 2015 (Division E of the Consolidated and Further Continuing Appropriations Act, 2015, Pub. L. 113-235):

1) The recipient may not require its employees, contractors, or sub-recipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.
2) The recipient must notify its employees, contractors, or sub-recipients that the prohibitions and restrictions of any internal confidentiality agreements inconsistent with paragraph 1) of this award provision are no longer in effect.
3) The prohibition in paragraph 1) of this award provision does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.
4) If the Government determines that the recipient is not in compliance with this award provision, it:
    a. Will prohibit the recipient's use of funds under this award, in accordance with section 743 of Division E of the Consolidated and Further Continuing Resolution Appropriations Act, 2015, (Pub. L. 113-235) or any successor provision of law; and
    b. May pursue other remedies available for the recipient's material failure to comply with award terms and conditions.

14. Data Collection.

Data collection activities, if any, performed under this Grant are the responsibility of the recipient. Awarding agency support of the project does not constitute approval of the survey design, questionnaire content, or data collection procedures. The recipient shall not represent to respondents that such data are being collected for or in association with the awarding agency without the specific written approval of the cognizant awarding agency official. However, this requirement is not intended to preclude mention of the awarding agency support of the project in response to an inquiry or acknowledgment of such support in any publication of this data.

15. Publications and Acknowledgement of Sponsorship.

Publication of results of the research project in an appropriate professional journal is encouraged as an important method of recording and reporting scientific information. .

The recipient agrees that in the release of information relating to the grant, such release shall include the following statement, "The project or effort depicted was or is sponsored by the Department of the Defense, Defense Threat Reduction Agency. The content of the information does not necessarily reflect the position or the policy of the federal government, and no official endorsement should be inferred." For purposes of this provision, information includes news releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, symposia, etc.

When issuing statements, press releases, requests for proposals, bid solicitations, and other documents describing projects or programs funded in whole or in part with federal money, all recipients receiving federal funds, shall clearly state: (i) the percentage of total costs of the

program or project which will be financed with federal money, and (ii) the dollar amount of federal funds for the project or program.

16. Authorization to Perform Activities Abroad.

If the award recipient is a foreign institution, the recipient assures that it has been duly authorized to operate and do business in the country or countries in which the grant is to be performed; that it has obtained all appropriate licenses, permits, and approvals required in connection with the grant's proposed activities; and that it will fully comply with all the laws, decrees, labor standards and regulations of such country or countries during the performance of the grant. U.S. Government funds may not be used in support of a project which is prohibited by law in the country or countries in which it is undertaken. DTRA does not assume responsibility for the recipient's compliance with the laws and regulations of the country or countries in which the activities are to be conducted.

17. Inconsistency between English Version and Translation of Grant.

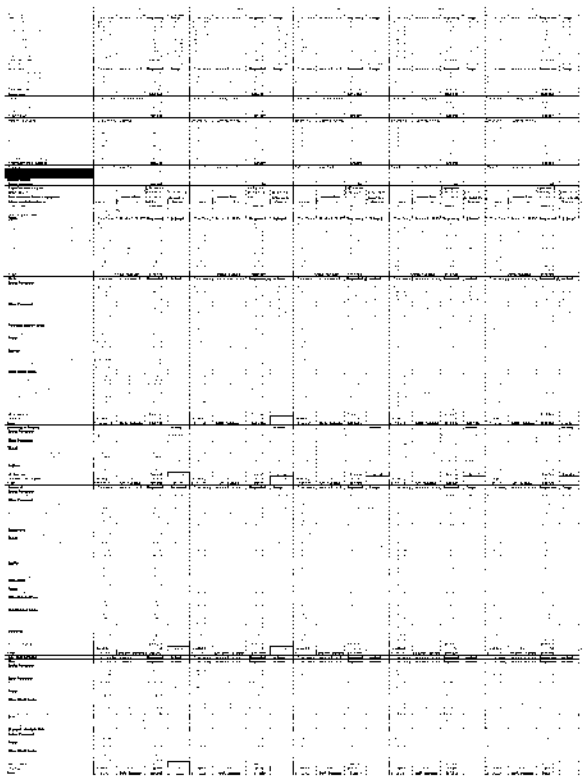
The foreign recipient shall ensure that all contract correspondence that is addressed to the U.S. Government is submitted in English or with an English translation. In the event of inconsistency between the terms of the grant and any translation thereof into another language, the meaning in the English language shall control.

18. Value Added Tax (VAT) and Other Taxes.

Prior to grant proposal submission, the recipient will require any supplier of goods or services using grant funds to consult with it, so as to avoid the imposition of such charges with respect to the goods and/or services in question, where possible. As regards to excise duties and other taxes imposed on the sale of goods or services (e.g. VAT), the recipient will require any supplier of goods or services using grant funds to verify in consultation with the recipient whether in the country where the VAT would be payable, if the recipient is exempt from such VAT or other taxes at the source, or entitled to claim reimbursement thereof. If the recipient is exempt from VAT or other taxes or entitled to claim reimbursement thereof, the recipient shall not include costs for VAT or other taxes in the grant proposal. However, the recipient may include costs in their proposal to pay for VAT costs associated with travel, including and limited to lodging, meals, and transportation. In the event that the recipient is not exempt from VAT or other taxes and is unable to claim reimbursement thereof, the recipient must itemize VAT and/or other taxes in the grant proposal. Prior to grant award, DTRA and the recipient shall mutually agree upon the use of DTRA funds for VAT or other taxes or if needed, revise project activities accordingly.

During implementation of grant activities, the recipient will notify DTRA as soon as they become aware of any VAT or other taxes, exceeding $500.00 per transaction, not identified in the grant proposal and outside those considered VAT costs associated with travel, including and limited to lodging, meals, and transportation. A "transaction" is defined as a single purchase by the recipient and transactions may not be deliberately split in order to avoid compliance with the $500.00 limit. DTRA approval in writing with documentation of extraordinary circumstances is required prior to the recipient using any DTRA funds for VAT

or other taxes exceeding $500.00 per transaction, and a grant modification may be required. The recipient understands that in the event that DTRA is unable to secure approval to use DTRA funds for VAT or other taxes exceeding $500.00 per transaction, the purchase of applicable items may not proceed. If DTRA and the recipient mutually agree to use DTRA funds to pay VAT or other taxes on any item(s) exceeding $500.00 per transaction, the recipient will include this information in its financial reports to DTRA.



	Y1	Y2	Y3	Y4	Y5	
MR	13187	14516	12416	15052	13552	
BK	11815	11815	11815	11815	12501	
CM	14216	7988	16124	7245	4844	
Int Conf travel		4900	4900	4900	4900	
Dom Conf travel	1260	4120	4120	4120	4120	1260
Meet Assaf	550	550	550	550	550	
Total	**41028**	43889	49925	43682	40467	

Dom Total	$1,810	$4,670	$4,670	$4,670	$4,670
Intn'l Total	$39,218	$39,219	$45,255	$39,012	$35,797
Total	$41,028	$43,889	$49,925	$43,682	$40,467
		39033	45191	38419	35654
	38175				

From: Amanda Andre
To: (b)(6)
Cc: William B. Karesh; Dr. Melinda Rostal; Aleksei Chmura; (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: FRBAA14-6-2-0333
Date: Monday, July 8, 2019 3:01:07 PM
Attachments: EHA RVF2 Budget_Final.xlsx

Dear all,

Dr. Karesh asked me to send the attached budget.

Best,

Amanda Andre, LMSW
Program Coordinator

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4470 (direct)
1.212.380.4465 (fax)
Caution-www.ecohealthalliance.org

EcoHealth Alliance leads cutting-edge scientific research into the critical connections between human and wildlife health and delicate ecosystems. With this science, we develop solutions that prevent pandemics and promote conservation.

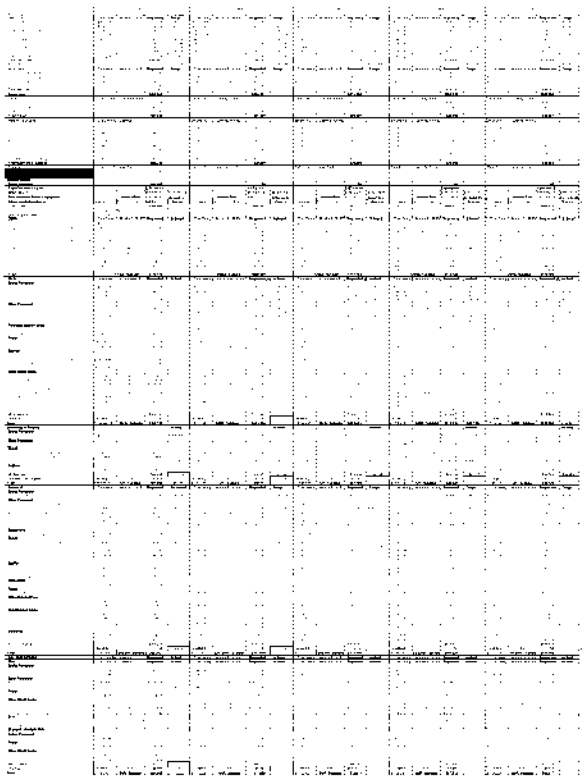
On Mon, Jul 8, 2019 at 2:49 PM Robinson, Adrea A CTR (USA) <(b)(6)
Caution-(b)(6) > wrote:

Thank you for responding so quickly. Please send what you have, because we (Contracts) actually look at more detail than what was required for the grants.gov < Caution-http://grants.gov > submission.

Thank you,

(b)(6)

From: William B. Karesh <karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >
Sent: Monday, July 8, 2019 2:46 PM



	Y1	Y2	Y3	Y4	Y5	
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Total	$41,028	$43,889	$49,925	$43,682	$40,467
		39033	45191	38419	35654
	38175				

To: (b)(6)
Caution

Cc: Dr. Melinda Rostal <rostal@ecohealthalliance.org < Caution-mailto:rostal@ecohealthalliance.org > >; Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >; (b)(6)

(b)(6)

Caution-mailto (b)(6) > >; Amanda Andre <amanda.andre@ecohealthalliance.org < Caution-mailto:amanda.andre@ecohealthalliance.org > >

Subject: [Non-DoD Source] Re: FRBAA14-6-2-0333

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

We have a budget for the project in Excel format, but it contains more itemized details than that required for submission into the proposal submission system - i.e. multiple rows in our version have to be combined to result in the totals for some of the fields we entered into grants.gov < Caution-http://grants.gov > < Caution-Caution-http://grants.gov < Caution-http://grants.gov > > .

We can send you the version we have, but do understand that the rows will not all match one-to-one with the submission format.

Please let me know how you would like us to proceed.

William B. Karesh, D.V.M

Executive Vice President for Health and Policy

EcoHealth Alliance

460 West 34th Street - 17th Floor

New York, NY 10001 USA

+1.212.380.4463 (direct)

+1.212.380.4465 (fax)

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics.

On Jul 8, 2019, at 2:16 PM (b)(6) Caution-Caution-(b)(6) Caution-mailto(b)(6) > wrote:

Good Afternoon,

Please provide DTRA with a copy of your budget/cost proposal in MS Excel. Please ensure all project years are included and all formulas are visible.

Thank you,

(b)(6) Contractor

Contract Specialist

All Native Group

(b)(6)

(b)(6)

Caution- ution-
>

Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics
PI: William B. Karesh
Thrust Area 6 - Cooperative Counter Weapons of Mass Destruction Research with Global Partners FRCWMD

Statement of Work

Project Title: *Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics*
Document Date: December 5, 2018

Objective: The objective of this grant is to reduce the threat of RVF by improving the understanding of RVFV circulation during inter-epidemic periods, improving local capacity to predict periods of high risk for RVF outbreaks and determining the multi-sectoral cost of RVF in the Republic of South Africa (RSA). Studies in the Free State/Northern Cape (FS/NC) and KwaZulu-Natal (KZN) regions will generate new understanding of RVF maintenance, circulation and impacts and improve risk prediction models for the country. Through multi-disciplinary investigation of three core hypotheses, the project shall strengthen South Africa's leadership role within the African continent to reduce the threat of RVF and other vector-borne diseases through the characterization of RVFV epidemiology and ecology in tropical and temperate ecosystems.

Scope: The grantee proposes a five-year multi-disciplinary study of epidemiology, ecology and socio-economic factors in RSA. The grantee team shall focus on the following major goals and milestones:

1. Characterize changes in RVFV activity in mosquitoes and sheep as the length of the inter-epidemic period increases (Y1-OY2).
   - Implement sheep cohort (FS), vector sampling (FS & KZN) and the collection of remote-sensing data; develop and implement new aspects of vector field studies (Y1 & Y3); create an *Aedes* pan distribution map (Y2).
2. Determine seroprevalence and characterize the risk factors associated with RVFV exposure in humans and domestic ruminants in KZN (Y1).
   - Modify research materials for the isiZulu speaking population; adapt the approach and implement a One Health cross-sectional study; conduct risk factor analysis.
3. Identify the socioeconomic impact of RVFV in regions where RVFV is present with and without a history of RVFV outbreaks (Y1-Y3; OY4).
   - Establish study protocols, identify economic variables and assess the economic impact of RVFV in FS/NC, KZN (Y1-3) and nationally (OY4), produce a report for policy makers.
4. Develop and implement a sustainable early warning system for RVFV in RSA.
   - Collate data collected previously and this study (Y1-3); launch prediction system on ARC website (Y3); maintain/test the prediction system (OY1-2).
5. Improving knowledge and capacity (Y1-OY2)
   - Maintain and develop new collaborations with stakeholders; transfer technology for additional diagnostic capacity at OVR; provide policy recommendations based on socio-economic analysis, training of local technical personnel; training of graduate students and post-doctoral fellow; publishing and sharing of project findings; host entomological and One Health economics workshops and annual Partners and Stakeholders Meetings.

Background: Rift Valley fever virus (RVFV) is a mosquito-borne virus of public and animal health significance. The WHO recently listed RVFV as an R&D Blueprint priority disease, noting that **fundamental research is needed on the epidemiology and entomology of RVF, including multidisciplinary studies**. RVFV ecology is complex and poorly understood, involving ruminant hosts, human behavior, and mosquito vectors with associated climatic and environmental factors. These gaps in knowledge hinder determination of risk of RVF. **RVF outbreaks are devastating to farmers**, resulting in abortion in nearly 100% of pregnant ruminants and high mortality rates among young ruminants (up to 90%). RVFV causes influenza-like symptoms and occasional retinitis in people, with a small percentage developing severe complications, such as, hepatitis, hemorrhagic fever and encephalitis, which may result in death. RVF outbreaks also have significant socio-economic impacts and are interspersed with apparent quiescent periods (no reported clinical RVF cases). Multiple species of mosquito vectors are responsible for transmitting RVFV to animals. Floodwater *Aedes* spp. are hypothesized to transmit the virus transovarially and their desiccation-resistant **eggs can lie dormant for unquantified periods of time**. Newly emerged, infected *Aedes* adults can initiate epizootics when conditions are suitable. Susceptible *Culex* spp. can subsequently amplify the outbreak. Given the high spatial resolution required to characterize flooded areas (pans), pan density and other characteristics have frequently been left out of most spatio-temporal models. The evidence for cryptic RVF transmission among livestock in some areas is clear, yet the underlying mechanisms are poorly understood.

Preliminary Data: This project builds on the five-year BTRP-funded "Understanding Rift Valley Fever in the Republic of South Africa" Project (URVFRSAP), which was focused on identifying a variety of ecological factors associated with the abundance and succession of *Aedes* and *Culex* mosquitoes, as well as patterns of immunity in ruminant and human hosts in a region where multiple, large outbreaks of RVF are known to have occurred in the Free State and Northern Cape Provinces. Despite the magnitude of these outbreaks (producers lost an estimated US$26.1 million in 2010-11) we found livestock to be highly susceptible (estimated at only 30% seroprevalence of antibodies against RVF). During the inter-epidemic period, we identified an incidence rate of 3.2% seroconversions per sheep-year. We associated several soil and vegetation factors with previous RVF livestock cases that will provide a foundation for improved RVF predictions. Preliminary findings from project partners suggest RVFV may be endemic in parts of KwaZulu-Natal (KZN), where clinical RVF has not been reported but where the seroconversion rate is extremely high (54% per animal-year; Van den Bergh, In Prep). We developed a strong relationship with stakeholders in South Africa, with 54 participants from 26 public and private institutions attending our recent Stakeholders and Partners Meeting in Pretoria. We strengthened our relationship with the Department of Agriculture, Forestry and Fisheries, by presenting regular updates and incorporating their feedback into our project. Applying a rigorous One Health investigation, the URVFRSAP has generated critical knowledge, capacity and a strong stakeholder base for South Africa to serve as a regional leader in the threat reduction of RVF.

Key references include (further references can be found in the Project Narrative):

Anyamba A, *et al.* 2010 Prediction, assessment of the Rift Valley fever activity in east and southern Africa 2006-2008 and possible vector control strategies. Am J Trop Med Hyg. 83(2):43-51.

Linthicum, K. J., *et al.* 1984 Mosquito species encountered in a flooded grassland dambo in Kenya. Mosq News 44: 228-232.

Mdlulwa, Z. & Klein, K. 2015 Socio-economic impacts of lumpy skin disease and Rift Valley fever on the South African livestock economy. (ARC-LNR Report).

Williams, R., *et al.* Anomalous high rainfall and soil saturation as combined risk indicator of Rift Valley fever outbreaks, South Africa, 2008-2011. Emerg Infect Dis 22 (2016).

***Tasks/Scientific Goals:* (Format: Year #(s).Task #. Sub-task#)**

Task Y1.1-YO2.1: Characterizing ecological factors affecting RVFV and RVFV vectors.
To improve understanding of RVFV risk in relation to climate and remote sensing indicators, vector distribution and RVFV circulation in mosquitoes, and mosquito egg survival to elucidate the role of ecological determinants, the grantee shall monitor rainfall (verified by on-site weather stations installed during the URVFRSAP), temperature, and vegetation conditions. The grantee shall utilize geospatial information sources (including long-term (2000-2017) high-resolution scenes covering areas where the 2008 to 2011 outbreaks occurred, Landsat data, ARC Land Type maps, and historical outbreak maps) to assess changes over time that may be correlated with RVF risk, including *Aedes* abundance. To monitor vector dynamics, the grantee shall select approximately 5 sites (pans) from among previous URVFRSAP sites for weekly longitudinal mosquito sampling in the FS/NC study region during the wet season (and at intervals during the dry season/winter). The awardee shall select 1-3 sites in KZN for monthly sampling to improve our understanding of the vector dynamics in this region. The grantee shall conduct quantitative real time RT-PCR for RVFV on pooled mosquito samples (by species) at NICD. The awardee shall analyze bioecological and ecological factors, produce an *Aedes* pan distribution map and develop a real-time RVF outbreak prediction system monitoring RSA. To understand survival, *Aedes* eggs shall be collected and maintained in controlled conditions for varying periods of time. After varying time periods, eggs shall be stimulated to hatch in a containment facility at the NICD before being collected for species identification and PCR-testing.

Y1.1.1-OY2.1.1 Collection of climatic data to identify different patterns associated with *Aedes* abundance.
Y1.1.2-OY2.1.2 Assess the abundance and diversity of mosquitoes, conduct egg desiccation trials.
Y2.1.3 Develop *Aedes* pan distribution map.
Y3.1.4 Complete research synthesis report across project tasks.
Y3.1.5 Mosquito mark-recapture study on the ecology of floodwater *Aedes*.
Y3.1.6 Develop an early warning system for RVF in the Republic of South Africa.
OY2.1.7 Complete analysis of all mosquito data.

Task Y1.2-YO2.2: Improve the capacity for South Africa to be a regional leader in vector-borne diseases and Rift Valley fever virus epidemiology.
Strengthening scientific capacity is a key pathway for promoting sustainability of hypothesis-driven research for RVF threat reduction. The grantee shall mentor four graduate students in project-related subjects, including epidemiology, public health, entomology, soil sciences, or laboratory sciences at local universities. The awardee shall support a post-doctoral fellow (named in key personnel) who is interested in becoming an expert in medical entomology and will split his time between UP and NICD and contribute to sample collection, identification, and analysis. The project shall facilitate technology transfer of inhibition ELISA to OVR to expand

laboratory capacity for the detection of RVFV exposure in animals and concurrently supporting operational capacity of the RSA National One Health Forum. To provide capacity strengthening and development in vector-borne disease and RVFV epidemiology to aide in threat reduction, the grantee shall organize three workshops with participants from southern/South Africa, including one on entomology (Y1) and two on One Health economics (Y3 and OY2).

Y1.2.1-OY2.2.1 Train a minimum of four graduate students in fields related to RVF.
Y1.2.2-OY2.2.2 Train post-doctoral fellow in medical entomology.
Y1.2.3 Conduct entomology workshop for participants from southern Africa.
Y2.2.4 Technology transfer of inhibition ELISA to OVR.
Y3.2.5 & OY2.2.5 Conduct One Health economics workshop for participants from southern Africa.

Task Y1.3-OY2.3: Identify patterns of RVFV exposure in ruminants in the absence of an RVF outbreak.

The project shall monitor RVFV exposure in ruminants to inform understanding of inter-epidemic circulation in sheep populations. Despite an absence of reported cases in areas of KZN, preliminary findings from project partners have indicated that RVF may be endemic in some of these areas within the province. The grantee shall conduct a cross-sectional study of domestic ruminants from up to 158 households in the KZN study area to determine RVFV seroprevalence. Under a One Health approach, households will be enrolled (Task 5) in the cross-sectional study to analyze epidemiology factors and human and animal seroprevalence levels. To improve the knowledge of antibody waning and changes in seroconversion rates, cohort sheep from the URVFRSAP in the FS/NC study area shall be re-enrolled to complete a longitudinal study over the useful lifespan of a sheep (8 years total). Serological testing of cross-sectional and cohort animal blood samples will be conducted using inhibition ELISA and may be confirmed with IgM ELISA or virus neutralization testing.

Y1.3.1 Local permissions are obtained.
Y1.3.2 Conduct cross-sectional study in KZN.
Y1.3.3-OY2.3.3 Implement sheep cohort in FS.
Y1.3.4-OY2.3.4 Conduct serological testing on all cohort and/or cross-sectional animal blood samples.
Y3.3.5 Complete research synthesis report across project tasks.
OY2.3.6 Complete analysis of ruminant cohort data.

Task Y1.4-OY2.4: Identify the socioeconomic impact of RVF within the study areas and nationally.

The awardee team believes that socio-economic determinants of RVF risk are important to understand in tandem with epidemiological and ecological factors to inform successful threat reduction. Prior studies by project partners have estimated substantial agricultural production losses to farmers in the FS and NC during the 2010-2011 outbreak; however, wider impacts of RVF, including those that may be occurring but not reported in inter-epidemic periods and those to a wider range of agricultural and non-agricultural sectors, have not been accounted for to date. The grantee shall use a One Health approach to more comprehensively investigate micro-and macro-socio-economic impacts of RVF across multiple sectors. The grantee shall collect socio-economic, spending, and loss data at household/farm level to estimate micro-socio-economic impact in KZN (conducted concurrently with the cross-sectional studies in described in Tasks 3

and 5). The grantee shall collect the same socio-economic data from households/farms in the FS/NC study area in Year 3. The grantee shall also conduct a study of national-level impacts, targeted to government and industry to identify multi-sectoral implications of RVF risk (OY1). Economic data will be paired with epidemiological data to inform prevention and control scenarios and compare cost-effectiveness. Workshops shall be held in Y3 and OY2 to strengthen regional capacity for economic analysis using a One Health approach, with a focus on policy-making for threat reduction of RVF and other zoonotic diseases. Holding two workshops should allow for multi-sectoral involvement and framing of the workshop exercises around timely stakeholder-informed policy questions and topics.

Y1.4.1 Obtain local permissions to conduct surveys.
Y1.4.2 & Y3.4.2 Conduct survey of livestock farmers to estimate spending and losses related to RVF.
Y3.4.3 Complete research synthesis report across project tasks.
OY1.4.4 Conduct survey of public and private institutions at provincial and national level to estimate spending and losses related to RVF.
OY1.4.5 Determine sectoral costs and benefits and develop associated policy recommendations.
OY2.4.6 Complete final report for policy makers.

Task Y1.5-OY2.5: Compare RVFV exposure in people in areas with different patterns of clinical RVF.

The grantee shall conduct a cross-sectional study of humans (and animals, see Task 3) in the KZN region to compare RVFV exposure patterns with the FS/NC region. The awardee shall characterize the risk of RVFV infection to people by initiating a household level cross-sectional study (a questionnaire and blood sampling). The grantee shall translate the previously written (URVFRSAP) vector-borne and zoonotic diseases booklet into isiZulu for distribution in KZN. Laboratory testing of the samples will be conducted at NICD and may include the following tests: total antibody (IgG/IgM) RVF ELISAs, inhibition ELISA, IgG specific RVF ELISAs, IgM specific RVF ELISAs, and RVFV neutralization test.

Y1.5.1 Modify and translate written questionnaire for risk analyses of RVFV infection and the written information booklet on RVF and other vector-borne diseases.
Y1.5.2 Serosurvey awareness to the community.
Y1.5.3 Conduct written questionnaire in conjunction with blood collection.
Y1.5.4 Collect blood samples from participants in the household cross-sectional study.
Y1.5.5 & Y2.5.5 Conduct serological analyses for human anti-RVFV IgG and IgM.
Y2.5.6 Complete report of results.
Y3.5.7 Complete research synthesis report across project tasks.

Task Y1.6-OY2.6: Disseminate reports to relevant stakeholders.

The grantee shall synthesize all data collected through the projects described above as well as capacity building activities in South Africa. An annual report shall be developed and disseminated to local stakeholders. A database for the extensive amount of data shall be developed and used for epidemiological analyses. The project shall submit annual sample repository information using a DTRA-specified format. Access to all samples collected and data generated during the course of the project, up to and including at least 12 months after the project end date. Scientific and general reports shall be generated and findings shall be presented as

specified in the grant schedule. A stakeholder meeting shall be held annually to describe the project and the current results. Community feedback meetings shall be held to provide aggregate findings and engage with local stakeholders through the project. These dissemination pathways shall provide opportunities to gain stakeholder input, including to inform policy questions and considerations to optimize recommendations for threat reduction to be generated by the socio-economic study.

Y1.6.1-OY2.6.1 Submit reports, including sample repository data, to DTRA.
Y1.6.2-OY2.6.2 Complete annual report to local stakeholders.
Y1.6.3-OY2.6.3 Host annual stakeholders meeting.
Y1.6.4-OY2.6.4 Conduct presentations/meetings at times and places specified in the grant schedule (Y1 Task 6), including DTRA Annual Technical Review.
Y1.6.5-OY2.6.5 Submit publications.

Performance Schedule:

Task	Year 1	Year 2	Year 3	Option Year 1	Option Year 2
Task 1. Characterizing ecological factors affecting RVFV and RVFV vectors.					
1.2 Assess the abundance and diversity of mosquitoes, conduct egg desiccation trials.					
1.3 Develop Aedes pan distribution map.					
1.4 Complete research synthesis report across project tasks.					
1.5 Mosquito mark-recapture study on the ecology of floodwater *Aedes*.					
1.6 Develop an early warning system for RVF in the Republic of South Africa					
1.7 Complete analysis of all mosquito data.					
Task 2. Improve the capacity for South Africa to be a regional leader in vector-borne diseases and Rift Valley fever virus epidemiology.					
2.2 Train post-doctoral fellow in medical entomology.					
2.3 Conduct entomology workshop for participants from southern Africa.					
2.4 Technology transfer of inhibition ELISA to OVR.					
2.5 Conduct One Health economics workshop for participants from southern Africa.					
Task 3. Identify patterns of RVFV exposure in ruminants in the absence of an RVF outbreak.					
3.1 Local permissions are obtained.					
3.2 Conduct cross-sectional study in KZN.					
3.3 Implement sheep cohort in FS.					
3.4 Conduct serological testing on all cohort and/or cross-sectional animal blood samples.					
3.5 Complete research synthesis report across project tasks.					
3.6 Complete analysis of ruminant cohort data.					
Task 4. Identify the socioeconomic impact of RVF within the study areas and nationally.					
4.1 Obtain local permissions to conduct surveys.					
4.2 Conduct survey of livestock farmers to estimate spending and losses related to RVF.					
4.3 Complete research synthesis report across project tasks.					
4.4 Conduct survey of public and private institutions at provincial and national level to estimate spending and losses related to RVF.					
4.5 Determine sectoral costs and benefits and develop associated policy recommendations.					
4.6 Complete final report for policy makers.					
Task 5. Compare RVFV exposure in people in areas with different patterns of clinical RVF.					
5.1 Modify and translate written questionnaire for risk analyses of RVFV infection and the written information booklet on RVF and other vector-borne diseases.					
5.2 Serosurvey awareness to the community.					
5.3 Conduct written questionnaire in conjunction with blood collection.					
5.4 Collect blood samples from participants in the household cross-sectional study.					
5.5 Conduct serological analyses for human anti-RVFV IgG and IgM.					
5.6 Complete report of results.					
5.7 Complete research synthesis report across project tasks.					
Task 6. Disseminate reports to relevant stakeholders.					
6.1 Submit reports, including sample repository data, to DTRA.					
6.2 Complete annual report to local stakeholders.					
6.3 Host annual stakeholders meeting.					
6.4 Conduct presentations/meetings at times and places specified in the grant schedule (Y1 Task 6), including DTRA Annual Technical Review.					
6.5 Submit publications.					

BUDGET JUSTIFICATION FOR ECOHEALTH ALLIANCE

EcoHealth Alliance requests a total of $4,899,297.20 over all-years of the proposed project to support personnel, travel, equipment, consortium agreements, and applicable indirect costs.

A. Key Personnel

William B. Karesh, D.V.M., Principal Investigator (2 calendar months for all years) 3 calendar months for OY2). Dr. Karesh will be responsible for the overall coordination of this project. He will provide overall project oversight, study design development and refinement, data analysis, publication support, and annual stakeholder meeting participation. We request $48,535 in Y1 with a 5% cost of living increase each subsequent year.

Jonathan Epstein, Ph.D., Co-Investigator (1.0 calendar month in all years). Dr. Epstein will be a technical advisor to the project, advising on data interpretation, targeted animal sampling based on data as they come in over the course of the project, and laboratory techniques. He will also assist with writing and dissemination. We request $14,597 in Y1 with a 5% cost of living increase each subsequent year.

Noam Ross, Ph.D., Senior Research Scientist, Modeler (1 calendar month in all years). Dr. Ross will be a technical advisor to the project, advising on data organization, analysis, and writing with a focus on statistical analytics. We request $8,138 in Y1 with a 5% cost of living increase each subsequent year.

Emily Hagan, M.P.H., Behavioral Risk Scientist (3.0 calendar months in all years). Ms. Hagan will provide medical anthropology expertise for the questionnaires and analysis, supervise and conduct the IRB processes and trainings on the human subject work for local partners, and assist with data organization and analysis. We request $16,937 in Y1 with a 5% cost of living increase each subsequent year.

Catherine Machalaba, M.P.H, Policy Advisor (3.5 calendar months in all years), Ms. Machalaba will be a technical advisor to the project, advising on study design and risk reduction. She will conduct a risk reduction workshop in OY2 and will help develop revised biosurveillance and reporting strategies with and for Liberian partners. We request $25,050 in Y1 with a 5% cost of living increase each subsequent year.

Whitney Bagge, Ph.D., Modeler (7 calendar months Y1-OY1, 7.5 calendar months in OY2). Dr. Bagge will provide day-to-day project development and strategic management, including through regular in-person meetings and weekly phone and other direct communications with partners. She will also supervise field sampling, data analysis, and data and information dissemination through workshops, conferences, and papers, for which we request $50,225 in Y1 with a 5% cost of living increase each subsequent year.

B. Other Personnel

Amanda Andre, LMSW, Operations Assistant (5.5 calendar months in all years). 4 calendar months for OY2. Ms. Andre will be the administrative lead handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics. She will coordinate all meetings and travel and ensure compliance with funding and contractual requirements. We request $27,373 in Y1 with a 5% cost of living increase each subsequent year.

Fringe Benefits

Fringe benefits are calculated as 36.8% of base salary p.a. with $70,234 requested in Y1 calculated from the base salary for all Personnel. In Y2 – OY2, we budget for a 5% per year cost of living allowance increase in all salaries.

C. Equipment
No funds are requested for equipment.

D. Travel
Domestic Travel
Domestic travel is requested for one trip per year for three program staff to travel from New York City to Washington, DC to meet with Co-Investigator Carlin and key personnel at Georgetown University. Transportation is estimated at $400 per trip along with the government GSA per diem rates for each city. Additional domestic travel support will facilitate four EcoHealth Alliance staff presenting at two domestic conferences annually. In total, we are requesting $13,795 in each year of our proposed work.

International Travel
Foreign travel is requested for partner meetings, in-country trainings, and field research. Seven EHA employees will attend annual meetings. Two EHA staff will make additional trips each year for trainings and field research. Flights for each of these trips is estimated at $3,500 and the federal per diem rates of $200 for lodging in Monrovia, Liberia and $70 for field work as well as the $95 for meals in Monrovia, Liberia and $46 for field work are requested. Additionally, we are requesting travel for staff to present on project findings at international conferences each year with flights estimated at $1,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria for International Meeting on Emerging Diseases and Surveillance (IMED). Travel costs are increased 5% each year to account for pricing increases based upon past, actual, annual price increases.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
Co-Investigator Epstein & Modeler/Ecologist Bagge will need a new computer, equipped with Microsoft and Adobe software for which we request $5,178 in Y1.

We request $6,830, annually for material and supplies, including office and travel supplies necessary for project aims for a total of $27,320 over five years. Materials estimated in this cost include Cell Phone Communication costs, Dropbox, Adobe, and Stata costs, and basic office supplies.

Publication Costs
To facilitate the dissemination of project findings, $3,190 per year in only Y2-OY2 is requested for open access publication costs in international peer-reviewed journals.

Consultant Services
For the human behavioral risk part of the project, $1,449 is requested in Y1, $1,126 in Y2 & OY1-OY2 and $1,526 in YR 3 for New England IRB and $3,500 in Y1 for required Collaborative Institutional Training Initiative training for personnel handling human and non-human animals and samples as per IRB and IACUC requirements. For Dr. Carlin, $15,000 per year is

requested. Dr Carlin will assist with partner communication, data analysis, and data and information dissemination through workshops, conferences, and papers.

Subawards/Consortium/Contractual Costs
Subcontracts for the National Public Health Institute of Liberia, Society for the Conservation of Nature-Liberia, Liberia Chimpanzee Rescue and Protection, University of Nebraska Medical Center and Georgetown University are outlined in their individual budget justifications.

H. Indirect Costs
We are requesting the EcoHealth Alliance federally approved indirect cost rate of 32% on all applicable direct costs. The USA Department of Defense's Department of the Navy has approved this rate on 17 July 2019. We have applied our indirect cost rate to the first $25,000 of the subcontracts only in Y1.

BUDGET JUSTIFICATION FOR NATIONAL PUBLIC HEALTH INSTITUDE OF LIBERIA, LIBERIA

The National Public Health Institute of Liberia (NPHIL) requests a total of $920,968 over all years of the proposed project to support personnel, travel, equipment, other direct costs and indirect costs.

A. Key Personnel

Mosoka Fallah, Ph.D., Co-Investigator (.6 calendar month for Y1-OY2). Dr. Fallah will provide overall project oversight for Liberia-based activities. NPHIL is charged with leading all public health and biomedical research in Liberia, and Dr. Fallah assumes that role for this project, leading all elements on the human subjects research side of the project as well as the laboratory diagnostics elements. Dr. Fallah will ensure NPHIL meets project tasks and milestones, will oversee NPHIL's budget, and will assist with dissemination of findings through publications and conference presentations. We do not request salary at this time as Dr. Fallah will be fully covered by other funding sources during the project period.

Fatorma Bolay, Ph.D., Co-Investigator (1.5 calendar month for Y1-OY2). As head of the Liberia Institute for Biomedical Research (LIBR) at NPHIL, Dr. Bolay will provide direct oversight of all laboratory activity for the project, for which $2,500 is requested starting in Y1.

John Dogba, Ph.D. Candidate, Co-Investigator (1.5 calendar month for Y1-OY2). Dr. Dogba directs the national reference laboratory at NPHIL and will ensure compliance with biosafety and biosecurity project requirements; as a lecturer at the University of Liberia he will also assist with identification and recruitment of students to work in the laboratory, activities for which $3,000 is requested starting in Y1.

Bode Shobayo, M.S.C., Co-Investigator (1.5 calendar month for Y1-OY2). As a research scientist within NPHIL's medical and public health research division, Dr. Shobayo will participate in training workshops, processing and testing a subset of samples, and reporting recommendations to Dr. Bolay and Dr. Wiley for process refinements and mitigating challenges with the day-to-day laboratory workflow, for which $2,075 is requested starting in Y1.

B. Other Personnel

Laboratory Scientists/Technicians (4 calendar months for Y1-OY2). Four laboratory scientists and/or technicians—two from NPHIL and two seconded from the Ministry of Agriculture—will process and test all project samples at LIBR. They will participate in all laboratory workshops, provide all bench activity (under the supervision of key personnel), and advise on inventory needs and any problems implementing the laboratory protocol. We request $18,667 for all four laboratory technicians starting in Y1.

Hospital Project Coordinators (6 calendar months for Y1-OY2). One coordinator will be appointed to each of two human clinical study sites (Redemption Hospital and Phebe Hospital) operating in Y1-Y3. These coordinators will be chosen from existing staff already participating in other febrile illness studies at the hospitals and will be responsible for participating in human subjects research training, ensuring hospital staff are sensitized to our inclusion criteria (and thus able to identify proper candidates), being available for consultation when patients enroll in the study, collecting consent form and questionnaire data from the patients, and ensuring samples are collected, stored, and transported in timely fashion. Similarly, one coordinator will

be appointed to each of two human clinical study sites (hospitals in Nimba and Lofa counties) in the option years, if funded. In an effort to train and engage Liberian nurses in public health surveillance and in research, at least one and possibly both of these sites will be staffed through Nursing for All, a non-profit that builds capacity in the nursing profession in Liberia and is presently operating at Ganta United Methodist Hospital in Nimba, one of the sites at which we would like to implement the study in OY1-2. We request $26,250 over the proposed five years of the project.

Hospital Laboratory Technicians (1 calendar month for Y1-OY2). Hospital laboratory technicians will assist with initial processing of patient samples (spinning serum, labeling, and storing) prior to transport to NPHIL. We will similarly provide salary support for technicians at the two option year hospitals if funded. We request $1,667 p.a. for these activities.

Post-doctoral Researcher (6 calendar months for Y3-OY2). Beginning in Y3, we propose to add a post-doctoral researcher to the laboratory team. Liberia does not have a PhD-granting institution, but a number of Liberians are presently undertaking PhD degree programs outside of the country; by Y3 we plan to bring one Liberian individual who has received a PhD in laboratory pathogen research into the project to work with the laboratory scientists on sample processing, testing, and data analysis, for which we request $5,000 starting in Y3.

Bachelors and Masters Students. We intend to include approximately three students per semester on the project, to include undergraduate and graduate students from the University of Liberia (Monrovia) and Cuttington University (Bong). Their duties will depend on their degree program but will include assignments at the human clinical sites (nursing, medical, public health, anthropology students); animal field collection sites (biology, animal science, ecology, anthropology); and laboratory (molecular biology, microbiology). We will preferentially choose students interested in developing their theses based on the project. Each student will receive a stipend of $500 per semester.

Administrator/Program Manager (6 months in Y1-OY2). This individual will act as the administrative lead, handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics, activities for which we request $5,000 p.a.

C. Equipment

The existing freezer in which PREDICT samples are stored at LIBR will remain there when the project ends, and will be available for this project's use, but its capacity is limited. LIBR will therefore require increased storage capacity for the specimens generated by this project (2,250 humans, up to 4,500 specimens; 3,840 animals, up to 14,560 specimens). A -80°C freezer is requested for sample storage and is estimated at $29,885. Liberia does not have a VAT and our conversations with Liberian partners indicate it is unlikely they will instate one in the near future. Government agencies and non-profits would be exempt from any such tax. If absolutely necessary, we would seek unrestricted funding sources to cover any such costs.

D. Travel

We are requesting travel for one Liberian project participant to attend a regional conference and an international conference in Y3 and OY2 to present on project findings, with flights estimated. For the regional conference flights are estimated at $750 and hotels and meals at the government GSA per diem rates for Accra, Ghana. For the international conference flights are estimated at $2,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria.

In Y3 we plan to bring one Liberian individual who has received a PhD in laboratory pathogen research into the project to work with the laboratory scientists on sample processing, testing, and data analysis as a post-doctoral associate. We will fund a one-month trip for this individual to the University of Nebraska Medical Center to train in the laboratory of co-Investigator Dr. Michael Wiley. A flight is estimated at $3,000 and hotels and meals at the government GSA per diem rates for Omaha, Nebraska.

In total over the course of the project, we are requesting $20,038 in for International Travel.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
We will supply the participating hospitals with all consumables required to collect patient samples, including serum tubes, EDTA tubes, cryovials, vacutainer holder, needles, syringes, nitrile gloves, and nasal swabs, for which we request $2,504 p.a. For the human clinical study implementation sites, our request also includes funding for a centrifuge to enable processing of serum at the hospital clinical laboratories ($460 each), an ultracold freezer to store the samples until picked up for transport ($4695 each) and a tablet for data collection and tracking at each site ($229 each).

Commented [MOU1]: Quote needed

Laboratory Testing
Our laboratory request covers three primary types of molecular testing: next-generation sequencing, real-time PCR, and ELISA-based antibody serology. In Y1, we will test 300 existing PREDICT bat and rodent samples, pooled by three, via NGS Ampliseq on LIBR's existing MiSeq machine. We will barcode 5% these, a process that most likely will be done outside of Liberia. In Y2-OY2, we will use a Taqman Array Card system (modified for a 96-well plate to run on LIBR's ABI 7000 sequencer) to test human samples for up to 31 pathogens at three samples per plate, and will run nasopharyngeal samples on singleplex PCR to test for key respiratory pathogens. We will run specific real-time PCR to confirm positives; NGS Ampliseq to further sequence viral-positive human samples (expect not more than 10% to fall into this category) and 10% of negative human samples; and specific antibody ELISAs on convalescent samples from humans who tested positive on TAC plus 20 of their neighbors. For animals in Y2-OY2, we have budgeted for specific antibody ELISAs on all animals, averaging 5 tests each, pooled by 5; NGS on 10% of animal samples pooled by three; singleplex PCR for confirmation of NGS positives (expect ~4%); a new ELISA reader; a new ELISA plate shaker; Mastermix; and miscellaneous consumables. We request $453,414 over the five years of the proposed project. Of this amount, $152,400 is for next-generation sequencing, $4,000 is for barcoding, and the remainder supports the PCR and ELISA testing, which are and will continue to be mainstays of the laboratory.

Meetings and Conferences
We request support for an annual meeting each year for 45 people including personnel from all partner institutions (EHA, NPHIL, SCNL, LCRP, UNMC, GU) as well as local stakeholders. Travel costs for United States-based participants to attend the annual meeting are covered in the EcoHealth Alliance budget. We estimate that for the three-day meeting, eight Liberian partners traveling from outside Monrovia will require transportation, meals and accommodation to be covered, and for Y3, when the annual meeting will function as a broader regional technical meeting, we will also fund two attendees from elsewhere in West Africa (likely Guinea) working

on similar studies. Additionally, the meetings will require a room rental, lunch for all participants, and printing of materials and supplies. Overall costs are estimated at $10,000 p.a.

We will conduct a series of workshops across the study period, as outlined in the technical proposal and in more detail in Attachment 3. *Workshop 1a* will cover the overall research study protocol, will occur at the Y1 kickoff meeting, and will include all project participants. *Workshop 2a* will cover the human study protocol and human subjects research, will occur mid-Y1 and again toward the end of Y3, and will include Tasks 2 and 4 personnel and students. *Workshops 3a and 3b* will cover biosafety, biosecurity, and laboratory techniques training, will occur twice during Y1 (at the kickoff meeting and again in the middle of the year) and during Y3, and will include all Task 3 personnel. *Workshop 4a* will cover the animal sampling protocol and animal subjects research, will occur at the kickoff meeting and during Y3, and will include all Task 4 personnel and students. *Workshop 5a* will cover analysis of laboratory data (including bioinformatics), will occur during Y2 as the laboratories ramp up their sample testing, and will include Task 3 personnel. *Workshop 6a* will cover risk reduction analysis and opportunities, will occur during OY2, and all personnel including many from ministries not directly involved in the project will be invited to attend. Across the workshops, the number of participants will vary from 10-20 people for whom we will require catering (lunch) for all participants, room rental, and some materials and supplies. Over the five proposed years of the project, $18,940 is requested to support these workshop trainings.

Two NPHIL personnel will travel to each of the five study communities for two-day, one-night trips to share study findings with community members and discuss risk reduction opportunities in OY1-2. Lodging, meals, and printed materials and supplies are estimated at $310 per visit.

Freezer Maintenance
Support of $500 p.a is requested to cover the cost of freezer maintenance (the newly-purchased freezer and LIBR's existing freezer) to ensure they are properly maintained, calibrated and in full working order at all times.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 10% on all direct costs.

BUDGET JUSTIFICATION FOR SOCIETY FOR CONSERVATION OF NATURE, LIBERIA

The Society for Conservation of Nature, Liberia (SCNL) requests a total of $685,069 over all years of the proposed project to support personnel, travel, equipment, and indirect costs.

A. Key Personnel
Michael Garbo, M.S., Co-Investigator (0.6 calendar months per year for all years). As head of SCNL, Mr. Garbo will be responsible for the oversight of all non-human animal sampling activities including preparation, staffing, implementation, and follow-up. He will further oversee the sample transport activity of both animal and human samples, for which SCNL is responsible. We do not request salary for him, since he will be fully covered by other SCNL funding sources.

B. Other Personnel
Annual support is requested for a field supervisor ($650/month), social scientist ($550/month), three field technicians ($550/month each), and two drivers ($330/month each) to make up the field research team. This team will be responsible for all aspects of animal field sampling, including planning, ordering supplies, implementation, ensuring all samples are safely and securely transferred to LIBR for testing, and any needed follow-up. This team will also administer a survey to the patients whose community they visit, administer a similar questionnaire to up to twenty additional community members, and with consent collect blood samples from these individuals for serological testing. Support is requested for an accounting assistant ($720/month) and an administrative assistant ($1,350/month) to assist with procurement, invoicing, scheduling, and field team logistics.

C. Equipment
A field vehicle for field sampling and sample transport is estimated at $45,000. Liberia does not currently have a VAT. Our conversations with Liberian partners indicate that it is unlikely that VAT will be instated in the near future. If it were, Government agencies and non-profits such as SCNL would be exempt from VAT.

D. Travel
Domestic Travel
Domestic travel support will cover fuel, vehicle maintenance, lodging and per diems for overnight trips ($50/day) for eight field team members for four, week-long field sampling trips. In addition to transporting the animal samples that it collects in the field, SCNL will also be responsible for picking up and safely and securely transporting all human samples from the clinical study sites to the Liberian Institute for Biomedical Research via the standing cold chain procedures they follow for the animal samples. Vehicle maintenance is calculated at $10,942 in Y1 for the two field vehicles, with higher costs estimated for the current vehicle due to its age and the condition of roads to be utilized, with a 2% increase in cost for each subsequent year. Fuel is estimated based on km to be traveled (664 total) weekly for sample transportation costs to both Phebe Hospital and Robertsport, as well as field travel from those locations and within a 50km radius. Vehicles are estimated to have a fuel efficiency of 20km/gallon with fuel currently costing $3.80/gallon. Cost is calculated at $45,103 in Y1.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies

We request $458 in Y1 for the purchase of two hand-held tablets with cases to be utilized by the field research team for data collection and organization (animal and human). Tablets will be used to conduct surveys off-line in the field, and to upload the data collected upon returning to SCNL offices. We request $589 for the purchase of a tarp, spade and 40 pitfall traps for rodent sampling. We request $442 for the purchase of a centrifuge to enable processing of medium- and large-animal blood samples in preparation for serological testing.

Field consumables including gloves, Tyvek suits, vacutainers, syringes and needles, EDTA collection tubes, non-EDTA collection tubes, cryotubes, TRIzol, and swabs are needed to conduct field sampling. The budget for consumables will enable us to test 3,360 animals over the course of the project (Y1: 160; Y2: 1,200; Y3: 800; OY1: 800; OY2: 400) and will cover a total of 12 sampling events (Y1: 4; Y2: 3; Y3: 2; OY1: 2; OY2: 1), with $37,943 budgeted for Y1 .

H. Indirect Costs

We are requesting a *de minims* rate of 10% on all allowable direct costs.

Months						EHA	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
2	2	2	2	3	$ 291,211.20	William Karesh, PI	$ 48,535.20	$ 50,961.96	$ 53,510.06	$ 56,185.56	$ 88,492.26	$ 297,685.04
						William Karesh Fringe	$ 17,860.95	$ 18,754.00	$ 19,691.70	$ 20,676.29	$ 32,565.15	$ 109,548.09
1	1	1	1	1	$ 175,159.66	Jon Epstein, Co-Investigator	$ 14,596.64	$ 15,326.47	$ 16,092.79	$ 16,897.43	$ 17,742.31	$ 80,655.64
						Jon Epstein Fringe	$ 5,371.56	$ 5,640.14	$ 5,922.15	$ 6,218.26	$ 6,529.17	$ 29,681.28
1	1	1	1	1	$ 97,650.00	Noam Ross, Senior Scientist, Modeler	$ 8,137.50	$ 8,544.38	$ 8,971.59	$ 9,420.17	$ 9,891.18	$ 44,964.82
						Noam Ross, Fringe	$ 2,994.60	$ 3,144.33	$ 3,301.55	$ 3,466.62	$ 3,639.96	$ 16,547.06
3.5	3.5	3.5	3.5	3.5	$ 85,884.88	Catherine Machalaba, Policy Advisor	$ 25,049.76	$ 26,302.24	$ 27,617.36	$ 28,998.22	$ 30,448.14	$ 138,415.72
						Catherine Machalaba Fringe	$ 9,218.31	$ 9,679.23	$ 10,163.19	$ 10,671.35	$ 11,204.91	$ 50,936.98
3	3	3	3	3	$ 67,747.18	Emily Hagan, Behavioral Risk Scientist	$ 16,936.80	$ 17,783.63	$ 18,672.82	$ 19,606.46	$ 20,586.78	$ 93,586.48
						Emily Hagan Fringe	$ 6,232.74	$ 6,544.38	$ 6,871.60	$ 7,215.18	$ 7,575.94	$ 34,439.83
7	7	7	7	7.5	$ 86,100.68	Whitney Bagge, Modeler/Ecologist	$ 50,225.40	$ 52,736.67	$ 55,373.50	$ 58,142.17	$ 65,409.95	$ 281,887.68
						Whitney Bagge Fringe	$ 18,482.95	$ 19,407.09	$ 20,377.45	$ 21,396.32	$ 24,070.86	$ 103,734.67
Fringe Rate-->			36.8%			Total Senior/Key Personnel	$ 223,642.40	$ 234,824.52	$ 246,565.75	$ 258,894.03	$ 318,156.59	$ 1,282,083.29
						B. Other Personnel						
5.5	5.5	5.5	5.5	4	$ 59,723.41	Amanda Andre, Operations Assistant	$ 27,373.23	$ 28,741.89	$ 30,178.99	$ 31,687.93	$ 24,198.06	$ 142,180.10
						Amanda Andre Fringe	$ 10,073.35	$ 10,577.02	$ 11,105.87	$ 11,661.16	$ 8,904.89	$ 52,322.28
23.0	23.0	23.0	23.0	23.0		Total Other Personnel	$ 37,446.58	$ 39,318.91	$ 41,284.85	$ 43,349.09	$ 33,102.95	$ 194,502.38
						C. Equipment						
							$ -	$ -	$ -	$ -	$ -	$ -
						Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
						D. Travel						
FY'20 -> FY'21 Increase:					3.0%	1. Domestic Travel	$ 13,795.00	$ 13,795.00	$ 13,795.00	$ 13,795.00	$ 13,795.00	$ 68,975.00
						2. Foreign Travel	$ 64,394.50	$ 65,831.50	$ 65,831.50	$ 65,831.50	$ 65,628.50	$ 327,517.50
						Total Travel	$ 78,189.50	$ 79,626.50	$ 79,626.50	$ 79,626.50	$ 79,423.50	$ 396,492.50
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance	$ -	$ -	$ -	$ -	$ -	$ -
						2. Stipends	$ -	$ -	$ -	$ -	$ -	$ -
						3. Travel	$ -	$ -	$ -	$ -	$ -	$ -
						4. Subsistence	$ -	$ -	$ -	$ -	$ -	$ -
						5. Other	$ -	$ -	$ -	$ -	$ -	$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 12,221.00	$ 6,830.00	$ 6,830.00	$ 6,830.00	$ 6,830.00	$ 39,541.00
						2. Publication Costs	$ -	$ 3,190.00	$ 3,190.00	$ 3,190.00	$ 3,190.00	$ 12,760.00
						3. Consultant Services	$ 18,500.00	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 78,500.00
						4. ADP/Computer Services	$ -	$ -	$ -	$ -	$ -	$ -
						5. Subawards/Consortium/Contractual Costs	$ 472,602.22	$ 479,396.69	$ 479,489.76	$ 424,942.40	$ 365,745.62	$ 2,222,176.70
						6. Equipment or Facility Rental/User Fees	$ -	$ -	$ -	$ -	$ -	$ -
						7. Alterations and Renovations	$ -	$ -	$ -	$ -	$ -	$ -
						8. Other	$ -	$ -	$ -	$ -	$ -	$ -
						9. Other	$ -	$ -	$ -	$ -	$ -	$ -
						Total Other Direct Costs	$ 503,323.22	$ 504,416.69	$ 504,509.76	$ 449,962.40	$ 390,765.62	$ 2,352,977.70
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 842,601.70	$ 858,186.62	$ 871,986.86	$ 831,832.03	$ 821,448.66	$ 4,226,055.87
						Modified Direct Costs	$ 369,999.48	$ 378,789.93	$ 392,497.10	$ 406,889.63	$ 455,703.04	$ 2,003,879.17
						H. Indirect Costs						
						1. Indirect Cost Type (DC-Equip)	$ 118,399.83	$ 121,212.78	$ 125,599.07	$ 130,204.68	$ 145,824.97	$ 641,241.33
						2. Indirect Cost Type (Subs)	$ 32,000.00	$ -	$ -	$ -	$ -	$ 32,000.00
						Total Indirect Costs	$ 150,399.83	$ 121,212.78	$ 125,599.07	$ 130,204.68	$ 145,824.97	$ 673,241.33
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 993,001.53	$ 979,399.40	$ 997,585.93	$ 962,036.71	$ 967,273.63	$ 4,899,297.20
						J. Fee						
						Fee	$ -	$ -	$ -	$ -	$ -	$ -
						K. Total Costs and Fee						
						TOTAL	$ 993,001.53	$ 979,399.40	$ 997,585.93	$ 962,036.71	$ 967,273.63	$ 4,899,297.20
						Subcontractor Totals						
						SCNL	$ 158,888.37	$ 148,890.92	$ 131,419.99	$ 131,665.89	$ 114,204.70	$ 685,069.86
						NPHIL	$ 169,453.66	$ 223,546.22	$ 223,810.22	$ 185,449.23	$ 118,709.07	$ 920,968.39
						GU-CGHS	$ 58,528.39	$ 23,566.36	$ 40,866.36	$ 24,434.09	$ 49,438.65	$ 196,833.85
						LCRP	$ 85,731.80	$ 83,393.20	$ 83,393.20	$ 83,393.20	$ 83,393.20	$ 419,304.60
						EHA TOTAL						
							$ 520,399.31	$ 500,002.70	$ 518,096.17	$ 537,094.31	$ 601,528.01	$ 2,677,120.50

IDC Rate-->	32.0%	
IDC Rate-->	32.0%	

EHA Supplies	Unit/Annual Price	Y1	Y2	Y3	OY1	OY2
Laptop (U)	$ 2,589.00	$ 5,178.00				
Stata (a)	$ 600.00	$ 600.00	$ 600.00	$ 600.00	$ 600.00	$ 600.00
Dropbox (a/pp)	$ 140.00	$ 420.00	$ 420.00	$ 420.00	$ 420.00	$ 420.00
Adobe (a/pp)	$ 177.00	$ 531.00	$ 531.00	$ 531.00	$ 531.00	$ 531.00
Endnote	$ 99.00	$ 99.00	$ 99.00	$ 99.00	$ 99.00	$ 99.00
MS Office	$ 94.00	$ 188.00				
Paperpile (a/pp)	$ 2.99					
Communications (pa)	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00
Zoom (a)	$ 180.00	$ 180.00	$ 180.00	$ 180.00	$ 180.00	$ 180.00
Skype (a)	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00
TOTALS		$ 12,221.00	$ 6,830.00	$ 6,830.00	$ 6,830.00	$ 6,830.00

Consultant Services	Y1	Y2	Y3	Y4	Y5
New England IRB	$ 1,449.00	$ 1,126.00	$ 1,526.00	$ 1,126.00	$ 1,126.00
CITI Trainings	$ 3,500.00				
Ellen Carlin	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ 15,000.00
	$ 18,500.00	**$ 15,000.00**	**$ 15,000.00**	**$ 15,000.00**	**$ 15,000.00**

	Y1	Y2	Y3	Y4	Y5	
International Travel						**TOTAL**
Traveller 1 - William Kangyk (Montreal)						
Hotel Max Per Diem	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	
Meals and Incidental Expenses Per Diem	$ 523.50	$ 523.50	$ 523.50	$ 523.50	$ 523.50	
Flight Estimate	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 25,112.50
Traveller 2 - Whitney Bagge (Montreal)						
Hotel Max Per Diem	$ 3,000	$ 3,000	$ 3,000	$ 3,000	$ 3,000	
Meals and Incidental Expenses Per Diem	$ 1,568	$ 1,568	$ 1,568	$ 1,568	$ 1,568	
Flight Estimate	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	
No. Days	8	8	8	8	8	
No. Trips per Year	3	3	3	3	3	
Total	$ 15,067.50	$ 15,067.50	$ 15,067.50	$ 15,067.50	$ 15,067.50	$ 75,337.50
Traveller 3 - Whitney Bagge (Held)						
Hotel Max Per Diem	$ 1,960	$ 1,960	$ 1,960	$ 1,960	$ 1,960	
Meals and Incidental Expenses Per Diem	$ 1,334	$ 1,334	$ 1,334	$ 1,334	$ 1,334	
Flight Estimate	$ -	$ -	$ -	$ -	$ -	
No. Days	12	12	12	12	12	
No. Trips per Year	2	2	2	2	2	
Total	$ 7,294.00	$ 7,294.00	$ 7,294.00	$ 7,294.00	$ 7,294.00	$ 36,470.00
Traveller 4 - Ilse Eastern (Montreal)						
Hotel Max Per Diem	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Meals and Incidental Expenses Per Diem	$ 523	$ 523	$ 523	$ 523	$ 523	
Flight Estimate	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 25,112.50
Traveller 5 - Emily (Edmonton)						
Hotel Max Per Diem	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Meals and Incidental Expenses Per Diem	$ 523	$ 523	$ 523	$ 523	$ 523	
Flight Estimate						
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,522.50	$ 1,522.50	$ 1,522.50	$ 1,522.50	$ 1,522.50	$ 7,612.50
Traveller 5 - Emily (Tokyo)						
Hotel Max Per Diem	$ 1,960	$ 1,960	$ 1,960	$ 1,960	$ 980	
Meals and Incidental Expenses Per Diem	$ 1,334	$ 1,334	$ 1,334	$ 1,334	$ 667	
Flight Estimate	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 3,500	
No. Days	15	15	15	15	15	
No. Trips per Year	2	2	2	2	1	
Total	$ 10,294.00	$ 10,294.00	$ 10,294.00	$ 10,294.00	$ 5,147.00	$ 46,323.00
Traveller 6 - Amanda Andre (Montreal)						
Hotel Max Per Diem	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Meals and Incidental Expenses Per Diem	$ 523	$ 523	$ 523	$ 523	$ 523	
Flight Estimate	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 25,112.50
Traveller 7 - Roger Rees (Edmonton)						
Hotel Max Per Diem	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Meals and Incidental Expenses Per Diem	$ 523	$ 523	$ 523	$ 523	$ 523	
Flight Estimate	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 25,112.50
Traveller 8 - International Conferences (Bi-Annual)	Vienna					
Hotel Max Per Diem	$ 1,320	$ 1,980	$ 1,980	$ 1,980	$ 3,300	
Meals and Incidental Expenses Per Diem	$ 488	$ 732	$ 732	$ 732	$ 1,220	
Flight Estimate	$ 3,000	$ 4,500	$ 4,500	$ 4,500	$ 7,500	
No. Days	4	4	4	4	4	
No. People Attending	2	3	3	3	5	
Total	$ 4,814.00	$ 7,221.00	$ 7,221.00	$ 7,221.00	$ 12,035.00	$ 38,512.00
Traveller 9 - Catherine (Montreal)						
Hotel Max Per Diem	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Meals and Incidental Expenses Per Diem	$ 523	$ 523	$ 523	$ 523	$ 523	
Flight Estimate	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
No. Days	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 5,022.50	$ 25,112.50
Visa Fees	$ 1,360.00	$ 1,360.00	$ 1,360.00	$ 1,360.00	$ 1,360.00	
Vaccination Costs	$ 900.00					
Conference Registration Fees	$ 2,700.00	$ 2,700.00	$ 2,700.00	$ 2,700.00	$ 2,700.00	
YEARLY TOTALS	**$ 84,394.50**	**$ 65,831.50**	**$ 65,831.50**	**$ 65,831.50**	**$ 65,628.50**	

$360 single entry, $700 multiple

	Y1	Y2	Y3	Y4	Y5	
Domestic Travel						**TOTAL**
Traveller 1 - William Kangyk (NC-DC)						
Hotel Max Per Diem	$ 502	$ 502	$ 502	$ 502	$ 502	
Meals and Incidental Expenses Per Diem	$ 235	$ 235	$ 235	$ 235	$ 235	
Transportation Estimate	$ 400	$ 400	$ 400	$ 400	$ 400	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	
Traveller 2 - Whitney Bagge (NC-DC)						
Hotel Max Per Diem	$ 502	$ 502	$ 502	$ 502	$ 502	
Meals and Incidental Expenses Per Diem	$ 235	$ 235	$ 235	$ 235	$ 235	
Transportation Estimate	$ 400	$ 400	$ 400	$ 400	$ 400	
No. Days	3	3	3	3	3	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	
Traveller 3 - Catherine (Montreal to DC)						
Hotel Max Per Diem	$ 502	$ 502	$ 502	$ 502	$ 502	
Meals and Incidental Expenses Per Diem	$ 235	$ 235	$ 235	$ 235	$ 235	
Transportation Estimate	$ 400	$ 400	$ 400	$ 400	$ 400	
No. Days	3	3	3	3	3	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	$ 1,137.00	
Presenting Summit - Mtg ASTMH (Maryland)						
Hotel Max Per Diem	$ 1,884	$ 1,884	$ 1,884	$ 1,884	$ 1,884	
Meals and Incidental Expenses Per Diem	$ 994	$ 994	$ 994	$ 994	$ 994	
Transportation Estimate	$ 1,600	$ 1,600	$ 1,600	$ 1,600	$ 1,600	
No. Days	4	4	4	4	4	
People Attending	1	1	1	1	1	
Total	$ 4,478.00	$ 4,478.00	$ 4,478.00	$ 4,478.00	$ 4,478.00	
Presenting Domestic Mtg WDAI (Tahoe City)						
Hotel Max Per Diem	$ 1,808	$ 1,808	$ 1,808	$ 1,808	$ 1,808	
Meals and Incidental Expenses Per Diem	$ 1,098	$ 1,098	$ 1,098	$ 1,098	$ 1,098	
Transportation Estimate	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	
No. Days	5	5	5	5	5	
People Attending	1	1	1	1	1	
Total	$ 4,906.00	$ 4,906.00	$ 4,906.00	$ 4,906.00	$ 4,906.00	
Conference Registration Fees	$ 1,031.00	$ 1,031.00	$ 1,031.00	$ 1,031.00	$ 1,031.00	
YEARLY TOTALS	**$ 13,795.00**	**$ 13,795.00**	**$ 13,795.00**	**$ 13,795.00**	**$ 13,795.00**	

	Montreal	Other
Hotels	200	70
M&E	95	46

Y1	Y2	Y3	OY1	OY2	Base
12	0.6	1.2	0.6	1.2	$ 136,181.20
12	0.6	3.6	0.6	0.6	$ 114,767.20
		Fringe Rate-->			32%
Y1	Y2	Y3	OY1	OY2	Base

Georgetown	Y1	Y2	Y3	OY1	OY2	Total
A. Senior/Key Personnel						
Claire Standley, Assistant Professor (Co-Investig	$ 10,919.10	$ 5,517.78	$ 17,256.19	$ 5,743.68	$ 11,713.94	$ 49,050.69
Carol Standley, Fringe	$ 3,502.38	$ 1,787.78	$ 12,647.01	$ 1,858.97	$ 3,794.30	$ 14,590.48
Erin Sorrell, Assistant Professor (Co-Investigato	$ 11,476.70	$ 5,853.12	$ 8,976.18	$ 5,089.68	$ 6,211.37	$ 38,630.95
Erin Sorrell, Fringe	$ 3,716.46	$ 1,896.41	$ 1,934.34	$ 1,973.02	$ 2,012.49	$ 11,534.71
Total Senior/Key Personne	$ 29,614.64	$ 15,055.09	$ 22,837.72	$ 15,083.24	$ 23,729.15	$ 106,774.83
B. Other Personnel						
Research Assistant						
Total Other Personnel	$ -	$ -	$ -	$ -	$ -	$ -
C. Equipment						
Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
D. Travel						
1. Domestic Travel						$ -
2. Foreign Travel	$ 7,769.20	$ -	$ 3,272.50	$ -	$ 7,769.00	$ 18,810.50
Total Travel	$ 7,769.20	$ -	$ 3,272.50	$ -	$ 7,769.00	$ 18,810.50
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$ -
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$ -
5. Other						$ -
Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies	$ 150.20	$ 50.20	$ 150.40	$ 50.20	$ 95.20	$ 446.00
2. Publication Costs						$ -
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subaward/Consortium/Contractual Costs						$ -
6. Equipment or Facility Rental/User Fees						$ -
7. Alterations and Renovations						$ -
8. Other - Telecommunications	$ 200.00	$ 50.00	$ 50.00	$ 50.00	$ 200.00	$ 550.00
9. Other						$ -
Total Other Direct Costs	$ 350.20	$ 100.20	$ 200.40	$ 50.00	$ 295.20	$ 996.00
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ 37,733.84	$ 15,155.29	$ 26,310.62	$ 15,133.24	$ 31,793.35	$ 126,527.25
Modified Direct Costs						$ -
H. Indirect Costs						
DC Rate --> 56%						
1. Indirect Cost Type	$ 20,989.56	$ 8,411.14	$ 14,592.74	$ 8,423.65	$ 17,645.51	$ 70,262.60
IDC Rate-->						
2. Indirect Cost Type						$ -
I. Total Direct and Indirect Costs						
Direct + Indirect	$ 58,723.38	$ 23,566.43	$ 40,903.35	$ 24,434.09	$ 49,438.63	$ 196,789.85
J. Fee						
Fee						
K. Total Costs and Fee						
Total Costs	$ 58,723.38	$ 23,566.43	$ 40,903.35	$ 24,434.09	$ 49,438.63	$ 196,789.85

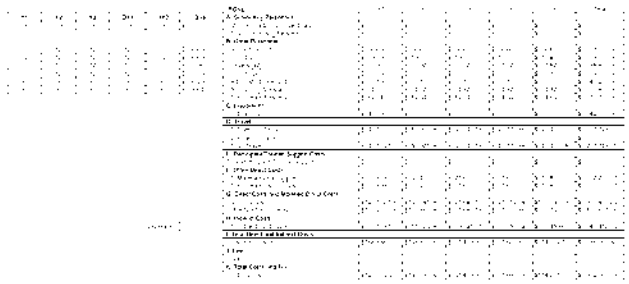
Supplies	Unit/Annual F	Y1	Y2	Y3	OY1	OY2
Encrypted storage device (x2)	2	55.00	$ 55.00			
Pens (dozen)	$ 9.85	$ 19.70	$ 19.70	$ 19.70		$ 19.70
USB Drives (unit)	$ 15.00	$ 15.00				$ 15.00
Notebooks (unit)	$ 3.15	$ 15.75	$ 15.75	$ 15.75		$ 15.75
Printing (page)	2 0.25	$ 40.00	$ 40.00	$ 40.00		$ 40.00
TOTALS		$ 150.20	$ 150.20	$ 150.20		$ 95.20

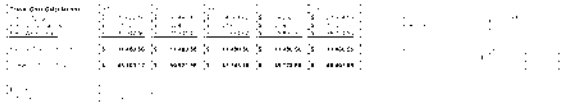
Telecommunications	Unit/Annual F	Y1	Y2	Y3	OY1	OY2
Skype (annual)	2	25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00
Cell Phone Texting (unit)	$ 50.00	$ 50.00				
Cell Phone - Roaming (unit)	$ 0.35	$ 100.00	$ 25.00	$ 25.00	$ 25.00	$ 125.00
Local Cell Phone (unit)		$ 25.00	$ 5.00	$ 5.00	$ 5.00	$ 50.00
TOTALS		$ 200.00	$ 50.00	$ 50.00	$ 50.00	$ 200.00

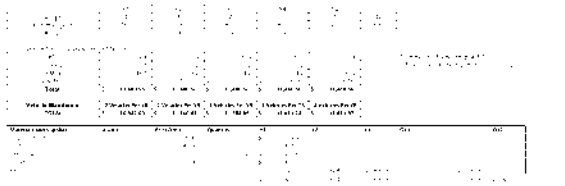
	Y1	Y2	Y3	Y4	Y5	TOTAL
International Travel						
Claire Standley: DC - Morocco						
Per Diem Rate	$ 300.00	$ 280.00	$ 280.00	$ 280.00	$ 280.00	
Hotel - Total	$ 1,800.00	$ -	$ -	$ -	$ -	$ 1,800.00
Meals & Incidentals - Per Diem	$ 95.00	$ 95.00	$ 95.00	$ 95.00	$ 95.00	$ 95.00
M&I Total	$ 522.50	$ -	$ -	$ -	$ -	$ 522.50
Taxi Estimate	$ 250.00	$ -	$ -	$ -	$ -	$ 250.00
Flight Estimate	$ 1,500	$ -	$ -	$ -	$ -	$ 1,500
No. Days	6	0	0	0	0	6
No. Trips per Year	1	0	0	0	0	1
Totals	$ 3,272.50	$ -	$ -	$ -	$ -	$ 3,272.50

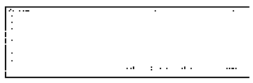
	Y1	Y2	Y3	Y4	Y5	TOTAL
International Travel						
Carol Standley: DC - Morocco						
Per Diem Rate	$ 300.00	$ 280.00	$ 280.00	$ 280.00	$ 280.00	
Hotel - Total	$ 1,800.00	$ -	$ 1,800.00	$ -	$ -	$ 3,600.00
Meals & Incidentals - Per Diem	$ 95.00	$ 95.00	$ 95.00	$ 95.00	$ 95.00	$ 95.00
M&I Total	$ 522.50	$ -	$ 522.50	$ -	$ -	$ 1,045.00
Taxi Estimate	$ 250.00	$ -	$ 250.00	$ -	$ -	$ 500.00
Flight Estimate	$ 1,500	$ -	$ 1,500	$ -	$ -	$ 3,000
No. Days	6	0	6	0	0	12
No. Trips per Year	1	0	1	0	0	2
Totals	$ 3,272.50	$ -	$ 3,272.50	$ -	$ -	$ 6,545.00

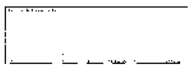
	Y1	Y2	Y3	Y4	Y5	TOTAL
International Travel						
Claire Held: Morocco						
Per Diem Rate	$ 70.00	$ 70.00	$ 70.00	$ 70.00	$ 70.00	
Hotel - Total	$ 280.00	$ -	$ -	$ -	$ -	$ 280.00
Meals & Incidentals - Per Diem	$ 46.00	$ 46.00	$ 46.00	$ 46.00	$ 46.00	$ 46.00
M&I Total	$ 207.00	$ -	$ -	$ -	$ -	$ 207.00
Domestic Transportation	$ 125.00	$ -	$ -	$ -	$ -	$ 125.00
Flight Estimate						
No. Days	5	0	3	0	0	5
No. Trips per Year	1	0	3	0	0	3
Totals	$ 612.00	$ -	$ -	$ -	$ -	$ 612.00
International Travel						TOTAL
Carol Held: Morocco						
Per Diem Rate	$ 70.00	$ 70.00	$ 70.00	$ 70.00	$ 70.00	
Hotel - Total	$ 280.00	$ -	$ -	$ -	$ -	$ 280.00
Meals & Incidentals - Per Diem	$ 46.00	$ 46.00	$ 46.00	$ 46.00	$ 46.00	$ 46.00
M&I Total	$ 207.00	$ -	$ -	$ -	$ -	$ 207.00
Taxi Estimate	$ 125.00	$ -	$ -	$ -	$ -	$ 125.00
Flight Estimate						
No. Days	5	0	3	0	0	5
No. Trips per Year	1	0	3	0	0	3
Totals	$ 612.00	$ -	$ -	$ -	$ -	$ 612.00
Visa Fees	$ 150.00		$ 75.00			
TOTAL	$ 7,769.00	$ -	$ 3,272.50	$ -	$ -	$ 7,769.00 $ 18,810.50











Sampling regime

	Specimen	Year 1	Year 2		Year 3		Year 4		Year 5		Subtotal
Human Monrovia & Phebe	Human blood	150	675		675		0		0		1500
	Human N/P	150	675		675		0		0		1500
Human Nimba & Lofa	Human blood	0	0		0		600		150		750
	Human N/P	0	0		0		600		150		750
Community samples for serology	Human blood	0	68	(3 comm)	42	(2 comm)	42	(2 comm)	21	(1 comm)	168
	Human individuals subtotal	150	675		675		600		150		**2250**
	Human specimens subtotal	300	1350		1350		1200		300		4500
Existing PREDICT samples (no sampling cost--just lab)	Bat, rodent blood	300	0		0		0		0		300
	Bat, rodent oral/NP	300	0		0		0		0		300
	Bat, rodent fecal	300	0		0		0		0		300
Animal prelim (Y1)	All species blood	640	0		0		0		0		640
	All species oral/NP	640	0		0		0		0		640
	All species fecal	640	0		0		0		0		640
Animal targeted community sampling (Y2-5)	All species	0	1200		800		800		400		3200
	All species oral/NP	0	1200		800		400		400		2800
	All species fecal	0	1200		800		400		400		2800
	Animal individuals subtotal	640	1200	(3 comm)	800	(2 comm)	800	(2 comm)	400	(1 comm)	**3840**
	Animal specimens subtotal	2560	4800		3200		2400		1600		14560
Annual subtotal specimens		2860	6150		4550		3600		1900		19060

Lab regime & budget

Rough Workflow

Item (green animal, blue human)	Unit cost ($)	Units/Year 1	$	Units/Year 2	$	Units/Year 3	$	Units/Year 4	$	Units/Year 5	$		
NGS Ampliseq on PREDICT samples	100	100	30000	0	0	0	0	0	0	0	0	30,000	
Barcoding (5% Y1 bats and rodents)	250	16	4100	0	0	0	0	0	0	0	0	4,100	
TAC (AFI) on human blood samples	65	0	0	675	43875	675	43875	600	39000	150	9750	136,500	
Single-plex real-time PCR on N/P samples	1.5	0	0	3037.5	4556.25	3037.5	4556.25	2700	6834.375	675	1012.5	16,959	
Specific real-time PCR on positives (expect 10%)	1.5	0	0	607.5	911.25	607.5	911.25	60	90	135	202.5	2,115	
NGS Ampliseq on all viral-positive human samples (≤ 10%) and 10% of negative human samples	300	0	0	90	27000	90	27000	80	24000	20	6000	84,000	
Specific antibody ELISAs on follow-up human samples (positive humans plus 20 neighbors)	10	0	0	6675	33375	6475	32375	100	5000	155	7750	78,500	
Specific antibody ELISAs (animal) (all animals, average 5 tests each)	10	640	6400	1200	12000	800	8000	800	8000	400	4000	38,400	
NGS (animal) (10% of animals)	300	21.33	6400	40	12000	26.67	8000	25.67	8000	13.33	4000	38,400	
Single-plex PCR for confirmation of NGS positives (expect 10%)	1.5	2.13	3.2	4	6	2.67	4	2.67	4	1.33	2	19	
New ELISA reader	3000	1	3000	0	0	0	0	0	0	0	0	3,000	
Plate shaker	1000	1	1000	0	0	0	0	0	0	0	0	1,000	
Mastermix	552	2	1104	2	1104	2	1104	2	1104	2	1104	5,520	
Misc consumables	1	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	15,000	
	TOTAL	$	54,907	$	137,827.50	$	128,825.50	$	95,032.38	$	36,821.00	$ 453,414	
			$ 54,907		$ 137,827.50		$ 128,825.50		$ 95,032.38		$ 36,821.00		

						LCRP	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
E	E	E	E	E	$ 135,000.00	Jim Desmond, Co Investigator	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 337,500.00
				Range Rate-->			$ -	$ -	$ -	$ -	$ -	$ -
						Total Senior/Key Personnel	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 67,500.00	$ 337,500.00
						B. Other Personnel						
							$ -	$ -	$ -	$ -	$ -	$ -
						Total Other Personnel	$ -	$ -	$ -	$ -	$ -	$ -
						C. Equipment						
						Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
						D. Travel						
						1. Domestic Travel	$ -	$ -	$ -	$ -	$ -	$ -
						2. Foreign Travel	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 41,560.00
						Total Travel	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 8,312.00	$ 41,560.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 2,126.00					$ 2,126.00
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other						$ -
						9. Other						$ -
						Total Other Direct Costs	$ 2,126.00	$ -	$ -	$ -	$ -	$ 2,126.00
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 77,938.00	$ 75,812.00	$ 75,812.00	$ 75,812.00	$ 75,812.00	$ 381,186.00
						Modified Direct Costs						$ -
						H. Indirect Costs						
					DC Rate-->	10.00%	1. Indirect Cost Type	$ 7,793.80	$ 7,581.20	$ 7,581.20	$ 7,581.20	$ 7,581.20	$ 38,118.60
					DC Rate-->		2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 85,731.80	$ 83,393.20	$ 83,393.20	$ 83,393.20	$ 83,393.20	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 85,731.80	$ 83,393.20	$ 83,393.20	$ 83,393.20	$ 83,393.20	$ 419,304.60

International Conferences (IHM)	Weeks
Hotel Max Per Diem	$ 668
Meals and Incidental Expenses Per Diem	$ 422
Flight Estimate	$ 1,200
No. Days	5
No. People Attending	1
Total	$ 4,222.00
YEARLY TOTAL	
Hotel Max Per Diem	$ 1,758
Meals and Incidental Expenses Per Diem	$ 494
Flight Estimate	$ 3,000
No. Days	7
No. People Attending	1
Total	$ 5,222.00
YEARLY TOTAL	$ 5,222.00

ECOHEALTH ALLIANCE
DOCUMENTATION TABLE OF CONTENTS

Paygroup: 5D7 Paygroup Name: Ecohealth Alliance Inc Report: Earnings Record Check Dates From : 01/31/2020-1 To: 01/31/202

01/31/2020	Andre, Amanda	000083	Regular	$ 56,879.44	$ 59,723.41
01/31/2020	Bagge, Whitney	100097	Regular	$ 82,000.08	$ 86,100.08
01/31/2020	Epstein, Jonathan	100002	Regular	$ 166,818.72	$ 175,159.66
01/31/2020	Hagan, Emily	100030	Regular	$ 64,521.12	$ 67,747.18
01/31/2020	Karesh, William	100015	Regular	$ 277,344.00	$ 291,211.20
01/31/2020	Machalaba, Catherine	100016	Regular	$ 81,795.12	$ 85,884.88
01/31/2020	Ross, Noam	000068	Regular	$ 93,000.00	$ 97,650.00

PAYMENT INFORMATION
Amanda Andre
460 W 34th St
17th Floor
New York, NY 10001

$398.00 Mastercard ending (b)(6)

Amtrak Total: $398.00

New York, NY - Penn Station to Washington, DC - Union Station
Mon. Feb 24, 2020- Mon. Feb 24, 2020

2h 51m TOTAL TRIP TIME

Mon. Feb 24, 2020	New York, NY (NYP)	Washington, DC (WAS)	**VALUE FARE**
2151 Acela	9:00 am	11:51 am	**1 Adult** **$215.00**
2h 51m	Mon. Feb 24	Mon. Feb 24	1 Business Class Seat **Included**

Washington, DC - Union Station to New York, NY - Penn Station
Thu. Feb 27, 2020- Thu. Feb 27, 2020

2h 49m TOTAL TRIP TIME

Thu. Feb 27, 2020	Washington, DC (WAS)	New York, NY (NYP)	**VALUE FARE**
2160 Acela	10:00 am	12:49 pm	**1 Adult** **$183.00**
2h 49m	Thu. Feb 27	Thu. Feb 27	1 Business Class Seat **Included**

CANCEL

COMPLETE PURCHASE

	6:29 PM – 11:58 PM United	8h 29m EWR – RNO	1 stop 1h 1m SFO	$486 round trip	
	4:25 PM – 9:58 PM American	8h 33m JFK – RNO	1 stop 49m PHX	$527 round trip	
	6:00 AM – 12:52 PM Ameri… · Operated by Compass Airlines as Americ…	9h 52m JFK – RNO	1 stop 1h 51m LAX	$528 round trip	
	4:57 PM – 9:58 PM American	8h 1m EWR – RNO	1 stop 33m PHX	$530 round trip	
	1:25 PM – 6:38 PM American	8h 13m JFK – RNO	1 stop 36m PHX	$577 round trip	
	7:45 AM – 12:37 PM United	7h 52m LGA–RNO	1 stop 1h 2m DEN	$781 round trip	

CITI PROGRAM

* INVOICE *

CITI Program, a division of BRANY
1981 Marcus Avenue, Suite 210
Lake Success, NY 11042
888-529-5929 Option 4 (US Toll Free)
+1-305-907-3097 (Outside US)
admin@citiprogram.org

Contact Information	Date	Number
EcoHealth Alliance Melinda Rostal 460 W 34th St., 17th Floor New York, NY 10001	5/3/2018	SO20181284
	P.O. No.	**Terms**
		Due on receipt

NOT-FOR-PROFIT REGULAR SUBSCRIPTION (One Year) Unlimited access to CITI Program series including Human Subjects Research (HSR), Good Clinical Practice (GCP), Information Privacy and Security (IPS), Animal Care and Use (ACU), and Responsible Conduct of Research (RCR) including the Conflicts of Interest (COI) course (custom module setup fees will apply for institution-specific modules). PAYMENT OPTIONS: 1 CHECK PAYMENTS: Please make check payable to CITI Program, a division of BRANY, and mail to the address listed above. 2 CREDIT CARD PAYMENTS: Please complete the Credit Card Authorization Form and submit by fax to (844)529-5929. To access the form, click here or copy and paste the link below: https://www.citiprogram.org/citidocuments/ccafpdf.pdf 3 ELECTRONIC FUNDS TRANSFER PAYMENTS: To request information for EFTs, please email: admin@citiprogram.org and insert the title: EFT Information Requested. Case #373112	1	3,500.00	3,500.00
This offer will expire SIX MONTHS from the date listed above	**Total**		$3,500.00

15

Bag

Computer (with AppleCare), mouse and keyboard unit: $2126 each

Here's what's in your bag.

Get free shipping and free returns on all orders.

Magic Keyboard - US English

5 ⌄ $495.00

Remove

Add a gift message Add

Order by 5pm, delivers:
Today within 2 hours - Fastest
Thu, Nov 7 - Free
Delivery options for: [redacted]

Pickup:
Today at Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray

1 ⌄ $1,699.00

Show product details ⌄ Remove

AppleCare+ for MacBook/MacBook Air $249.00
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: [redacted]

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

Magic Mouse 2 - Silver

5 ⌄ $395.00

Remove

Paygroup: 5D7 Paygroup Name: Ecohealth Alliance Inc Report: Earnings Record
Check Dates From : 11/29/2019-1 To: 11/29/2019-1

11/29/2019	Carlin, Ellen	100091	Regular	5,850.00	$ 140,400.00

Hourly Rate at termination	$	68.18
Add 10% overhead, benefits, et.	$	75.00

2020 IRB Fee Schedule
New England IRB

New England IRB

Services Rendered	Cost
Initial Review	
Initial Study Review (includes protocol, study materials and 1 Consent Form)	$1,449
Review of Central Principal Investigator (PI)/Change of PI/Co-PI	$851 / PI
Non-Scheduled IRB Meeting	$1,995
Each Additional Informed Consent Form (ICF) (per ICF / per PI)	$373
Canadian Protocol Level Review	$1,449
Continuing Review	
Continuing Review of Study	$1,126
Continuing Review of Central Principal Investigator	$875 / PI
Ongoing Oversight (*non-exempt research not requiring continuing review)*	$630 / PI
Change to Research After Initial Review	
New / Revised Informed Consent (per consent)	$402 / PI
Protocol Amendment / Clarification Letter (No Revision to ICF)	$440 / PI
Protocol Amendment (With Revision to the ICF)	$537 / PI
Review of Revised Product Information *(i.e. Clinical Investigator Brochure, Package Insert, DSMB reports)*	$255 / Document
Review of Recruitment Services & Supplemental Materials (Per Document)	$303
Distribution/Processing Fee	$130 / PI
Translation Services	Variable
Translation Review Administration Fee	$318 / Submission
Distribution/Processing Fee	$130 / PI
Translation Vendor Facilitation *(when WCG Preferred Vendor is not Used)*	$100 / PI
Close Out of Research	
Study Close Out – Study Level	$318
Principal Investigator Close Out	$265 / PI
Other Services and Fees	
Site Visit	Cost Plus $1,166
Duplication Request/Retrieval (Per Document)	$212
Administrative Fee for Submission not Using Connexus/IRBNet	$75 / Submission
Master Protocol / Complex Design Protocol Review	Contact BD
IRB Exemption Review	$1,097
New or Modified Generic or Non-Protocol Related Material *(for sites/institutions)*	$911
Annual Review of Generic or Non-Protocol Related Material	$911
Clinical Trial List Service (Per Study) – Optional Service	$2,500
Clinical Trial List Service Annual Renewal (Per Study)	$1,000

TERMS: Net 30 days unless otherwise agreed to in writing. Late payments may be subject to a monthly finance charge of 1.5% of the amount owed from the due date until payment in full. WCG shall be entitled to recover all reasonable attorneys' fees, costs and expenses associated with any efforts to recover payment for overdue invoices. Fees are subject to change without notice.

Effective: January 1, 2020

Software Fees

Quotation

Quote #	115815
Terms	NET 30
Contact	Megan Walsh walsh@ecohealthalliance.org (212) 380-4462
Quote Date	8/19/2019
Expires	8/26/2019

2823 Carlisle Ave.
Racine, WI 53404
p. (800) 342-4222
f. (800) 440-5036

Sales Rep: Tom Haven
tom.haven@ccbtechnology.com
p. (800) 342-4222

EcoHealth Alliance
Megan Walsh
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Accounts Payable
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Megan Walsh
460 W 34th St Fl 17
New York, NY 10001-2317
UNITED STATES
(212) 380-4460
walsh@ecohealthalliance.org

Adobe subscription renewal			Electronic Delivery

25	Adobe Acrobat Pro DC for Teams 12 month subscription renewal	$177.00	$4,425.00	2019-09-18	2020-09-17	
15	Adobe Creative Cloud for Teams 12 month subscription renewal	$370.00	$5,550.00	2019-09-18	2020-09-17	

Sub Total:	$9,975.00
Shipping and Handling:	$0.00
Tax Rate: (0.08875)	$0.00
Total	**$9,975.00**

Please note:

Return policies vary per manufacturer. (Apple and McAfee both have a no returns policy)

Custom configured items/built-to-order items are non-returnable.

Start dates and end dates for renewals may change based on the manufacturer's guidelines, policies, renewal order date, or date of activation.

Price is subject to change based on potential fluctuation of trade tariff regulation.

Dropbox Inc.
333 Brannan Street
San Francisco, CA 94107
United States
billing-support@dropbox.com

Invoice for EcoHealth Alliance

TO	DATE	INVOICE ID
Megan Walsh walsh@ecohealthalliance.org 10001 United States	February 25, 2019 6:50 AM GMT	SLSWTLNSKN5J

PRODUCT	PRICE	DISCOUNT	AMOUNT
Dropbox Business Advanced Plan (includes 3 licenses) + 60 Additional Licenses + Unlimited API Call Rate Limit + Unlimited Extended Version History (2/25/2019 to 2/25/2020)			
Dropbox Business Advanced Plan (includes 3 licenses)	$600.00	30%	$420.00
60 Additional Licenses	$12,000.00	30%	$8,400.00
Unlimited API Call Rate Limit	$0.00	30%	$0.00
Unlimited Extended Version History	$0.00	30%	$0.00
Total			$8,820.00

All amounts shown are in USD.

Clarivate
Analytics

Clarivate Analytics
Philadelphia, PA 19130
1500 Spring Garden Street, Suite 400
Philadelphia, PA 19130

To: Megan Walsh, Department Head, EcoHealth Alliance

Re: Your EndNote X9 Upgrade License Quote

Sent by e-mail: 10/16/2018

Thank you for your interest in our products. Please accept this letter (via e-mail) as our quote for Endnote X9.

License Type	Total Users	Total Price (excludes state tax, if applicable)
Endnote X9 Upgrade License (US$99.95 each)	40	US$3,998.00

Promotional Pricing Valid 11/16/2018

Purchasing Instructions:
If applicable, send Bill Durant your institution's Tax-Exempt Certificate for your state's tax to be excluded from your order

Contact Bill at 215-823-1797 or william.durant@clarivate.com to receive EndNote.

Premium access to EndNote Web – **Free**
Training and support - $0.00 – **Free**
Shipping – Digital Download - $0.00 – **Free**

You may place your order on a purchase order (terms are Net 30), by check/money order drawn on a U.S. bank or Visa/MasterCard/American Express.

Regards,

Bill Durant
Account Manager
(215) 823-1797
William.Durant@clarivate.com

2823 Carlisle Ave.
Racine, WI 53404
p. (800) 342-4222
f. (800) 440-5036

Invoice IN88282-1

Order #	88282
Terms	NET 30
Contact	Megan Walsh walsh@ecohealthalliance.org (212) 380-4462
Invoice Date	4/11/2018
Due Date	5/11/2018

Sales Rep: Tom Haven
tom.haven@ccbtechnology.com
p. (800) 342-4222

EcoHealth Alliance
Megan Walsh
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Accounts Payable
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
walsh@ecohealthalliance.org
(212) 380-4462

CCB Technology
Accounts Receivable
2823 Carlisle Ave.
Racine, WI 53404
(800) 342-4222

(10) Office 2016 Standard Edition licenses	Per Phone	

1	Microsoft Corporation	021-10552	10	Microsoft Office 2016 Standard Edition license	$94.00	$940.00

Sub Total:	$940.00
Shipping and Handling:	$0.00
Tax Rate: (0.00000)	$0.00
Total	**$940.00**
Credits/Payments:	$0.00
Total Due:	**$940.00**

Shipping Location

1	EcoHealth Alliance Megan Walsh 460 W 34th St Fl 17 New York, NY 10001-2317 UNITED STATES (212) 380-4460 walsh@ecohealthalliance.org	10	$940.00

Shipping Detail

4/10/2018	Microsoft Corporation	021-10552	

Tracking Numbers

4/10/2018	Other	*VIRTUAL (Unrecognized Number)*

Please note:

Return policies vary per manufacturer. (Apple and McAfee both have a no returns policy)

Custom configured items/built-to-order items are non-returnable.

Start dates and end dates for renewals may change based on the manufacturer's guidelines, policies, renewal order date, or date of activation.

altice business

AlticeBusiness.com

ECOHEALTH ALLIANCE

Monthly Summary	Page 1 of 2
Account Number	52804
Invoice Date	11/01/19
Invoice Number	100207378
Previous Balance	$3,934.66
Current Charges	$3,931.54
Total Amount Due	**$3,931.54**

Total Amount Due December 1, 2019

Usage From: 10/01/19 - 10/31/19

To contact Altice Business, please call (866) 611-3434 or (516) 803-6000, or feel free to e-mail us at Care@AlticeUSA.com

Enhanced Caller ID!

Altice Businesses newest enhancement is now included in Altice Business Voice services at no additional cost. Not only do we help take the guesswork out of who?s calling you, but now we can help detect robocalls too.

Visit the Customer Portal

View your invoice, service inventory, pay online, see Call Detail reports and more. Simply go to portal.alticebusiness.com. New access is available through the Request Access button. In person payments can no longer be accepted.

Important Messages:

New! Call Recording is now available for Business Hosted Voice services. Contact your Account Executive for details.

New York Sales Tax Breakdown For Our Common Bundles
Internet/Voice Bundle
66% of the total charge is attributable to Internet access service and 34% is attributable to voice service. For purposes of calculating the NY sales tax, 24.5% of the voice fee is attributable to interstate/international service.

Toll Free Bundle or Audio Conference Bundle
For purposes of calculating the NY sales tax, 76% of the fee is attributable to interstate/international service.

Enterprise Voice Bundle
For purposes of calculating the NY sales tax, 24.5% of the fee is attributable to interstate/international service.

altice business

AlticeBusiness.com

ECOHEALTH ALLIANCE	Page 2 of 2
Account Number	52804
Usage From	10/01/19 - 10/31/19

PAYMENTS, CREDITS AND ADJUSTMENTS:

Description	Total
10/22/2019 Payment - Thank You	-3,934.66

SERVICES:

Description	From Date - To Date	Qty	Non-Recurring	Recurring	Total
Managed Router	11/01/2019 - 11/30/2019	1	$0.00	$0.00	$0.00
100Mb/50K Internet/Voice Bundle	11/01/2019 - 11/30/2019	1	$0.00	$3,549.00	$3,549.00
Primary Rate Interface - ISDN	11/01/2019 - 11/30/2019	1	$0.00	$0.00	$0.00
DID Reserve 20 Numbers - 3 yr	11/01/2019 - 11/30/2019	7	$0.00	$60.00	$60.00
TOTAL SERVICE CHARGES			**$0.00**	**$3,609.00**	**$3,609.00**

TAXES AND SURCHARGES:

Description	Total
911 Surcharge(s)	24.00
Federal Excise Tax	1.92
Local Utility Gross Receipt Tax	82.76
MTA Surcharges	27.71
State and Local Gross Receipts Taxes	112.22
Universal Service Fund Surcharge	73.93

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1. The study presents the results of original research.
2. Results reported have not been published elsewhere.
3. Experiments, statistics, and other analyses are performed to a high technical standard and are described in sufficient detail.
4. Conclusions are presented in an appropriate fashion and are supported by the data.
5. The article is presented in an intelligible fashion and is written in standard English.
6. The research meets all applicable standards for the ethics of experimentation and research integrity.
7. The article adheres to appropriate reporting guidelines and community standards for data availability.

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Contact

Visit the Contact page for details about whom to contact with different queries.

Give Feedback

From: Joe Riccardi
To: (b)(6)
Cc: William B. Karesh; Aleksei Chmura; Amanda Andre; Catherine Machalaba
Subject: Re: [Non-DoD Source] Re: FRBAA14-6-2-0436 Clarifications
Date: Friday, May 8, 2020 1:13:05 PM

Good Afternoon (b)(6)

All salaries for key personnel are increased annually by 5% due to the exceptionally high cost of living increases in New York City where we are headquartered. EcoHealth Alliance bases this calculation on the Consumer Price Index plus an annual merit increase.

Cheers

Joe

On Thu, May 7, 2020 at 3:56 PM (b)(6)
Caution (b)(6) > > wrote:

> Good afternoon and I hope all is well.
>
> Can you please explain in detail further about the 5% cost of living increase per year.
>
> -----Original Message-----
> From: William B. Karesh <karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >
> Sent: Friday, April 17, 2020 5:10 PM
> To: (b)(6)
> Caution (b)(6) >
> Cc: Joseph Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > >; Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >; Amanda Andre <amanda.andre@ecohealthalliance.org < Caution-mailto:amanda.andre@ecohealthalliance.org > >; Catherine Machalaba <machalaba@ecohealthalliance.org < Caution-mailto:machalaba@ecohealthalliance.org > >
> Subject: Re: [Non-DoD Source] Re: FRBAA14-6-2-0436 Clarifications
>
>
>
> ---
>
> Dear (b)(6)

The field work refers to all project activities outside of Monrovia. We will be working in health care settings in rural areas in Bong County, Liberia and in small communities in the county. Thus we used the "other" category in the US State Department rate guide for activities outside of Monrovia. We used the same approach for are work over the last few years for USAID funded projects in Liberia.

Plan let us know if you would like additional information.

William B. Karesh, D.V.M
Executive Vice President for Health and Policy

EcoHealth Alliance
460 West 34th Street - 17th Floor
New York, NY 10001 USA

+1.212.380.4463 (direct)
+1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Apr 17, 2020, at 10:46 AM (b)(6) Caution (b)(6) > < Caution-Caution (b)(6) Caution (b)(6) > > wrote:

Good Morning and I hope all is well.

I do have a question as I am working on this. You stated " Flights for each of these trips is estimated at $3,500 and the federal per diem rates of $200 for lodging in Monrovia, Liberia and $70 for field work as well as the $95 for meals in Monrovia, Liberia and $46 for field work are requested". I noticed that you used the Per diem rates for Other, Liberia from the US State Department. Can you tell me what the field work entails?

-----Original Message-----
From: Joe Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > >
Sent: Thursday, April 9, 2020 3:50 PM
To: (b)(6) Caution (b)(6) < Caution-Caution (b)(6) Caution > >
Cc: Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org >

< Caution-Caution-mailto:chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >>; Amanda Fuchs <amanda.andre@ecohealthalliance.org < Caution-mailto:amanda.andre@ecohealthalliance.org > < Caution-Caution-mailto:amanda.andre@ecohealthalliance.org < Caution-mailto:amanda.andre@ecohealthalliance.org > >>; Catherine Machalaba <Machalaba@ecohealthalliance.org < Caution-mailto:Machalaba@ecohealthalliance.org > < Caution-Caution-mailto:Machalaba@ecohealthalliance.org < Caution-mailto:Machalaba@ecohealthalliance.org > >>; William B. Karesh <karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >>

Subject: |Non-DoD Source| Re: FRBAA14-6-2-0436 Clarifications

---

Good Afternoo(b)(6)

I just wanted to follow up and confirm you have received the email and it's contents below.

Thanks again

Joe

On Tue, Mar 31, 2020 at 3:14 PM Joe Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > < Caution-Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > > wrote:

Dea(b)(6)

Please find attached the documentation requested for our FRBAA14-6-2-0436 cost proposal. We have responded to the clarification questions and indicated both the document and page number where the full documentation/justification can be found. For each partner we have provided two files:

a) PDF document of our updated justification using tracked changes according to the current costs for all items based on the documentation.

b) PDF of the documentation that was requested on the clarification sheet.

Also included, an excel spreadsheet that includes our calculations for all costs and all partners corresponding to our updated justifications and documentation. Necessarily and following the documentation now provided, various costs have changed since our initial submission and our budget has been updated accordingly.

Our overall budget request is 4,899,297.20 with the annual amounts as follows:

Y1: $993,001.53
Y2: $979,399.40
Y3: $997,585.93
OY1: S962,036.71
OY2: S 967,273.63

Please e-mail or call if anything else is needed.

Cheers,

Joe

--

Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)

Caution-Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org > > <Caution-Caution-Caution-http://www.ecohealthalliance.org/ < Caution-http://www.ecohealthalliance.org/ > < Caution-Caution-Caution-http://www.ecohealthalliance.org/ < Caution-http://www.ecohealthalliance.org/ > > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

--

Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

From: Joe Riccardi
To: (b)(6)
Cc: William B. Karesh; Aleksei Chmura; Catherine Machalaba; Amanda Fuchs
Subject: [Non-DoD Source] FRBAA14-6-2-0436 Clarifications
Date: Tuesday, March 31, 2020 3:18:56 PM
Attachments: FRBAA14-6-2-0436_Clarifications.xlsx
DTRA Liberia Budget FINAL_.xlsx
Budget Justification_EHA.pdf
EHA Documentation.pdf
Budget Justification_SCNL_.pdf
SCNL Documentation.pdf
Budget Justification_NPHIL.pdf
NPHIL Documentation_.pdf
GU-CGHS Budget Justification.pdf
LCRP Documentation.pdf
GU-CGHS Documentation.pdf

Dear (b)(6)

Please find attached the documentation requested for our FRBAA14-6-2-0436 cost proposal. We have responded to the clarification questions and indicated both the document and page number where the full documentation/justification can be found. For each partner we have provided two files:

a) PDF document of our updated justification using tracked changes according to the current costs for all items based on the documentation.
b) PDF of the documentation that was requested on the clarification sheet.

Also included, an excel spreadsheet that includes our calculations for all costs and all partners corresponding to our updated justifications and documentation. Necessarily and following the documentation now provided, various costs have changed since our initial submission and our budget has been updated accordingly.

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Y2: $979,399.40
Y3: $997,585.93
OY1: $962,036.71
OY2: $ 967,273.63

Please e-mail or call if anything else is needed.

Cheers,

Joe

	DTRA Questions	EHA Responses	Documentation
1	Please provide documentation to support the proposed salaries (key and other personnel)	Please see the attached documentation of the salaries of current staff as well as that of the positions created by this grant.	PG.1
2	For domestic travel, please provide documentation (screenshots, links, quotes, etc.) for transportation cost	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget and documentation of all items is provided in the LHA Documentation file.	PG.2 3
3	Please provide documentation (quotes, screen shots, links, etc.) for consultant services to support the proposed cost.	A detailed breakdown is provided in the FRBAA14 6 2 0436 Detailed Budget. Hummingbird IRB has been aquired by New England IRB since original submission, Additionally, Key Personnel Ellen Carlin is no longer employed at EHA but will rather work on this project as a consultant. Please see attached documentation for all consultant costs.	PG. 4-15
4	Please provide a breakdown of the proposed materials and supplies, to include quantities and unit prices. Also, provide documentation (quotes, screen shots, links, etc) to support the proposed cost	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget and documentation of all items is provided in the LHA Documentation file.	PG. 4 15
5	Domestic conference location	A detailed breakdown is provided in the FRBAA14 6 2 0436 Detailed Budget for domestic conferences. There are two domestic conferences included in the budget one the ASTMH in Maryland along with WDA. For price estimates, the 2019 conference was hels in Tahoe City. Documentation is provided for flights from New York to the closest airport in Reno, NV.	
6	Departure location that the staff will be leaving from to present on project findings at the International conference in Austria	Staff will be departing from New York City to attend IMED in Austria.	
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	DTRA Questions	LCRP Responses	Documentation Page Number
1	Please provide documentation to support the proposed salaries (Key and other personnel)	LCRP is being subcontracted as a consultancy for the expertise of the director James Desmond who has years field experince working on EIDs generally, and in Liberia specifically. His previous contract with EHA for work on the PREDICT project is attached as salary support.	Pg. 1
2	For all travel proposed whether domestic and international, please provide departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc.	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget. Hotels, meals and incidentals are at the federal per diem levels. Each year there are two international trips: one from Monrovia, Liberia to Nyew York, New York for 7 days to collaborate with EcoHealth Alliance program staff, and one trip to an international conference to present on project findings. For budgeting purposes, this trip is from Monrovia, Liberia to Vienna, Austria to attend IMED for 4 days.	N/A
3	Please provide a breakdown of the proposed materials and supplies, to include quantities and unit prices. Also, provide documentation (quotes, screen shots, links, etc) to support the proposed cost.	A computer will be purchased for use during this project, price justification provided in the LCRP Documentation file.	Pg. 2
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	N/A	N/A
5			

	DTRA Questions	UNMC Responses	Documentation	NOTES
1	Please provide documentation to support the proposed salaries (key and other personnel)	Personnel from UNMC will be receiving funding to conduct work from another funding source and we are no longer requesting the proposed salaries. ASM will be another laboratory partner but neither needs funding under this project	N/A	
2	For all travel (proposed within the domestic and international), please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc	Personnel from UNMC will be receiving funding to conduct work from another funding source and we are no longer requesting the proposed salaries. ASM will be another laboratory partner but neither needs funding under this project	N/A	
3	For all travel (proposed (domestic and international)), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.)	Personnel from UNMC will be receiving funding to conduct work from another funding source and we are no longer requesting the proposed salaries. ASM will be another laboratory partner but neither needs funding under this project	N/A	
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	Personnel from UNMC will be receiving funding to conduct work from another funding source and we are no longer requesting the proposed salaries. ASM will be another laboratory partner but neither needs funding under this project	N/A	
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	DTRA Questions	SCNL Responses	Documentation Page Number
1	Please provide documentation to support all the proposed salaries (key and other personnel)	Please see the attached documentation of the salaries of current staff.	**PG.1**
2	One (1) nurse and two (2) administrative assitants were noted in the budget narrative but not included in budget. If they are needed please update budgte to reflect as such	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget. For this project, a nurse is not requested for SCNL. There will be a social scientist, a field supervisor, three field technicians, two drivers, a halt time administratice assistant and a halt time accounting	PG.1
3	For all travel proposed whether domestic and international, please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc.	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget.	PG.2-18
4	Please provide a breakdown of the proposed materials and equipment, to include quantities and unit prices. Please provide documentation (quotes, screen shots, links, etc.) to support the proposed prices.	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget. Equipment costs are for the purchase of a field vehicle with quote from vendor included.	PG.19-24
5	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	N/A	
6			

	DTRA Questions	GU-CGHS Responses	Documentation
1	Please provide documentation to support the proposed salaries	Please see attached letter from Prof Rebecca Katz, Director of the Center for Global Science and Security, confirming the salary rates in the GU-CGHS Documentation file.	Pg. 1
2	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget. Hotels, meals and incidentals are at the federal per diem levels. Taxi costs are estimated as $75 for transportation to and from origin airports, and $25 per day in-country transportation. Flights are the average price on a Fly America Act allowable flight, with documentation provided in the GU-CGHS Documentation file.	Pg. 2-3
3	Please provide documentation to support ODCs (screenshots links, quotes, etc.)	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget and documentation of all items is provided in the GU-CGHS Documentation file	Pg. 4-10
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	Please see attached NICRA, confirming federally approved indirect cost rate of 56% for research projects under the proposed period of performance in the GU-CGHS Documentation file	Pg. 11-14
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	DTRA Questions	NPHIL Responses	Documentation
1	Please provide documentation to support the proposed salaries (key and other personnel)	Please see the attached documentation of the salaries of current staff.	PG.1
2	Please provide a breakdown of the proposed materials and equipment, to include quantities and unit prices. Please provide documentation (quotes, screen shots, links, etc.) to support the proposed prices.	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget.	PG. 2-4
3	Please provide documentation to support ODCs (screenshots, links, quotes, etc.)	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget documentation of all items is provided in the NPHIL Documentation file.	PG.5-21
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	N/A	
5	Per CFR §200.413(b)(1), Equipment is unallowable as direct charges. Total direct cost excludes capital expenditures (buildings, individual items of equipment, alterations and renovations). Year 1 needs to be revised to not include equipment in proposed indirect rate cost.	A detailed breakdown is provided in the FRBAA14-6-2-0436 Detailed Budget. Year 1 has been updated to remove indirect from capital equipment.	
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7			

BUDGET JUSTIFICATION FOR GEORGETOWN UNIVERSITY CENTER FOR GLOBAL HEALTH AND SECURITY, UNITED STATES

The Georgetown University Center for Global Health and Security requests a total of $196,834 over all years of the proposed project to support personnel, travel, other direct costs, and indirect costs.

A. Key Personnel
Erin Sorrell, Ph.D., Co-Investigator (1.2 calendar months for Y1, .6 calendar months for Y2-OY2). Dr. Sorrell will provide subject matter expertise in support of the execution of the project, specifically related to study design and analysis and dissemination of findings for which $11,477 is requested in Y1, with a 2% increase each subsequent year. Dr. Sorrell's time will vary over the five years of the project based on involvement in specific tasks.

Claire Standley, Ph.D. Co-Investigator (1.2 calendar months for Y1, Y3, OY2, .6 calendar months for Y1, OY1). Dr. Standley will serve as the GU PI for the award, and will be the lead for all aspects of GU's contribution to the project, notably related to project design and analysis and dissemination of the findings for which $10,819 is requested in Y1, with a 2% increase each subsequent year. Dr. Standley's time will vary over the five years of the project based on involvement in specific tasks.

Fringe Benefits
Fringe benefits are calculated as 32.4% of base salary p.a. with $7,224 requested in Y1 for Key Personnel.

B. Other Personnel
No funds are requested for other personnel.

C. Equipment
No funds are requested for equipment.

D. Travel
International Travel
International travel will be used to support Dr. Sorrell to travel from Frankfurt, Germany to Monrovia, Liberia to attend the kick off meeting in Y1 and annual meetings in Y3 and OY2 for six days, and to continue onto the field in Y1 and OY2 for an additional 5 days. Dr. Standley will travel from Washington, DC to Monrovia, Liberia to attend the kick off meeting in Y1 and annual meeting in OY2 for six days, and to continue onto the field in Y1 and OY2 for an additional 5 days. Flights for all trips are priced at $1,500, along with $75 each way for airport taxis as well as $25 per day for in-country transportation. The federal per diem rates for Monrovia and Other are utilized. A total of $18,811 is requested for international travel over the five proposed project years.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies

We request $55 in Y1 to purchase an encrypted storage device and $30 to purchase 3 USB drives. Over the five years of the project we request $331 for other office supplies including pens ($51), notebooks ($75) and printing ($205).

Telecommunications
We request $550 over the five years of the project to support telecommunication costs including a Skype subscription ($25 p.a), mobile phone charges for project communication, including roaming charges while on international travel in Liberia ($285 total) and local airtime and data ($90 total). A cell phone for travel will be purchased in Y1 for $50.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 55.5% on all direct costs.

GEORGETOWN UNIVERSITY CENTER FOR GLOBAL HEALTH AND SECURITY
DOCUMENTATION TABLE OF CONTENTS

GEORGETOWN UNIVERSITY
Georgetown University Medical Center
Center for Global Health Science and Security

February 4, 2020

EcoHealth Alliance
460 West 34th St – 17th floor
New York, NY 10001

RE: Confirmation of salary rates

To Whom It May Concern:

This letter is to confirm the base salary rates used for the development of the proposal "Reducing the threat from high-risk pathogens causing febrile illness in Liberia", submitted to the Defense Threat Reduction Agency under Broad Agency Announcement HDTRA1-14-24-FRCWMDBAA.

I can confirm the following base annual salary rates for the two Center for Global Health Science and Security personnel for the proposed period of performance of the project:

- Dr. Claire J. Standley: $108,191.00
- Dr. Erin M. Sorrell: $114,767.00

We are projecting 10% effort for Dr. Standley in Y1, Y3, and OY2 of the project, and 5% in Y2 and OY1. For Dr. Sorrell, we are projecting 10% effort in Y1 and 5% effort thereafter. We use an assumption of a 2% annual salary increase, effective from the start of our fiscal year (July 1), when generating our proposal budgets. This is our standard practice across all submitted proposals.

If further evidence of salary levels is required, I would be happy to discuss this with you further over the phone or via email. My contact information is provided below.

Sincerely,

Rebecca Katz

Prof. Rebecca Katz, PhD MPH
Director
Center for Global Health Science and Security
Georgetown University
TEL: 202 251 4925
Email: Rebecca.Katz@georgetown.edu

Round trip | 1 passenger | Economy

Washington, D.C. | Monrovia ROB | Mon, Mar 16 | Fri, Mar 20

Bags | Stops | Airlines | Price | Times | Connecting airports | More

Track prices | Date grid | Price graph | Nearby airports

Best departing flights

Total price includes taxes + fees for 1 adult. Additional bag fees and other fees may apply. Sort by:

	7:00 PM – 8:10 PM+3 United, Brussels Airlines	21h 10m IAD–ROB	2 stops BRU, LPA	$1,525 round trip
	7:10 PM – 8:10 PM+1 Brussels Airlines, United	21h 0m IAD–ROB	2 stops BRU, LPA	$1,378 round trip
	10:15 PM – 8:10 PM−2 United, Brussels Airlines	41h 55m IAD–ROB	3 stops ⚠ EWR, BRU, LPA	$1,340 round trip
	10:55 PM – 8:10 PM+2 United, Brussels Airlines	41h 15m IAD–ROB	3 stops ⚠ LHR, BRU, LPA	$1,[illegible] round trip
	7:20 PM – 8:10 PM−1 Lufthansa, Brussels Airlines, United	20h 50m IAD–ROB	3 stops FRA, BRU, LPA	$1,727 round trip

Round trip 1 passenger Economy

Frankfurt Monrovia ROB Mon, Mar 16 Fri, Mar 20

Bags Stops Airlines Price Times Connecting airports More

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Departing flights

Sky pricer includes taxes + fees for 1 adult. Additional bag fees and other fees may apply Sort by

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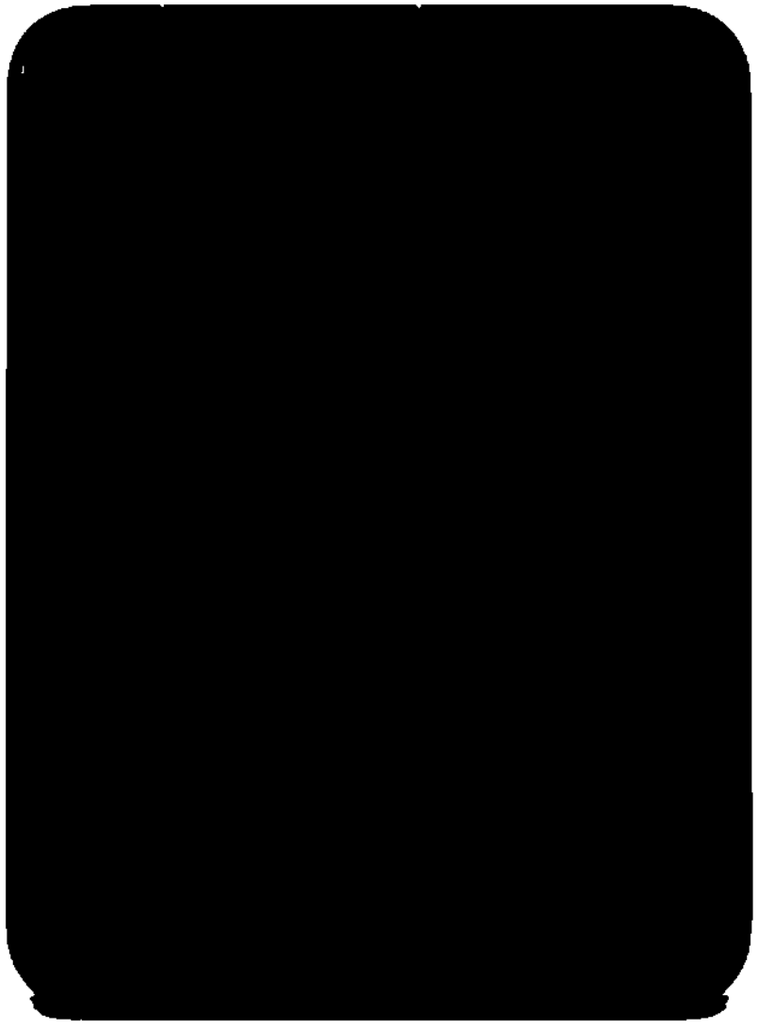
Lufthansa, Brussels Airlines	FRA – ROB	[illegible] FNA	round trip	
9:25 PM – 8:10 PM+1	23h 45m	2 stops ⚠	$1,[illegible]	
Lufthansa, Brussels Airlines	FRA – ROB	[illegible] FNA	round trip	

5 more flights



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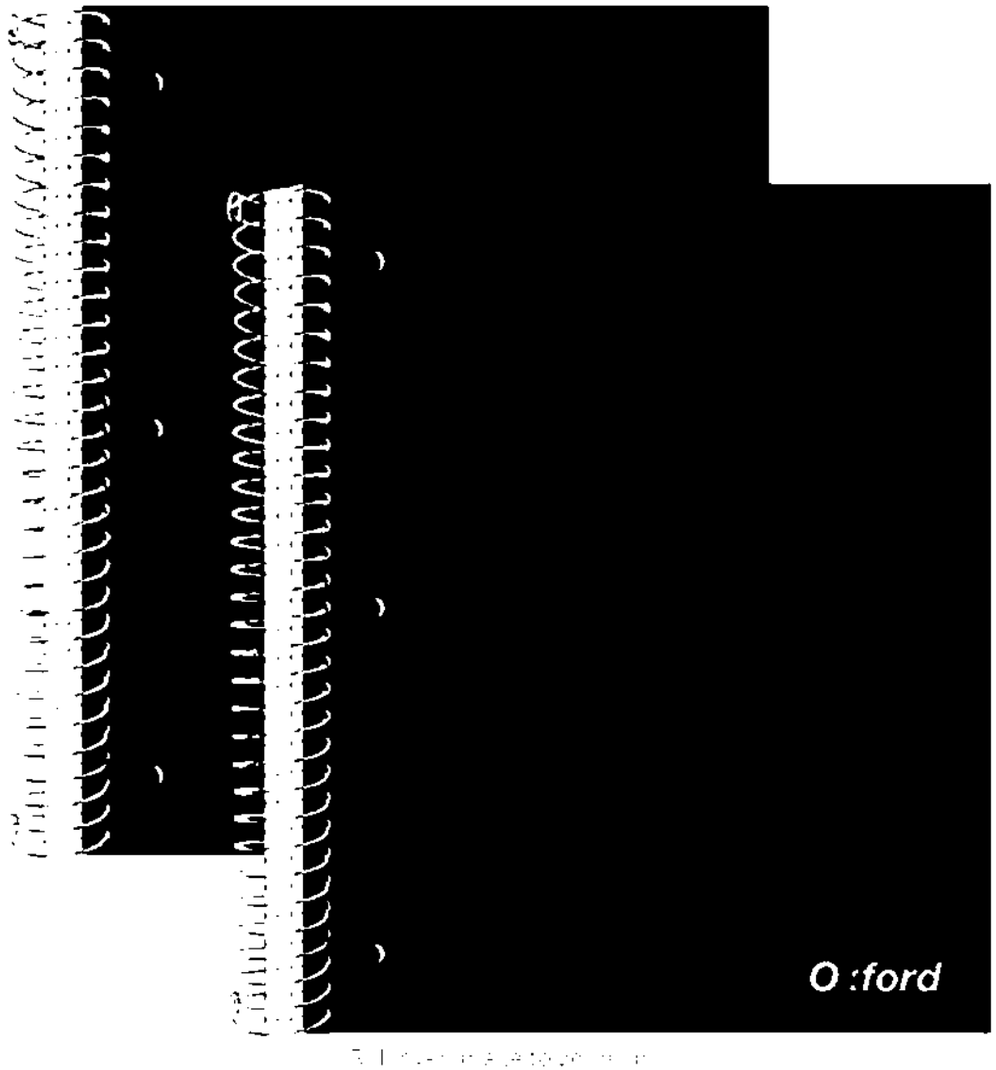

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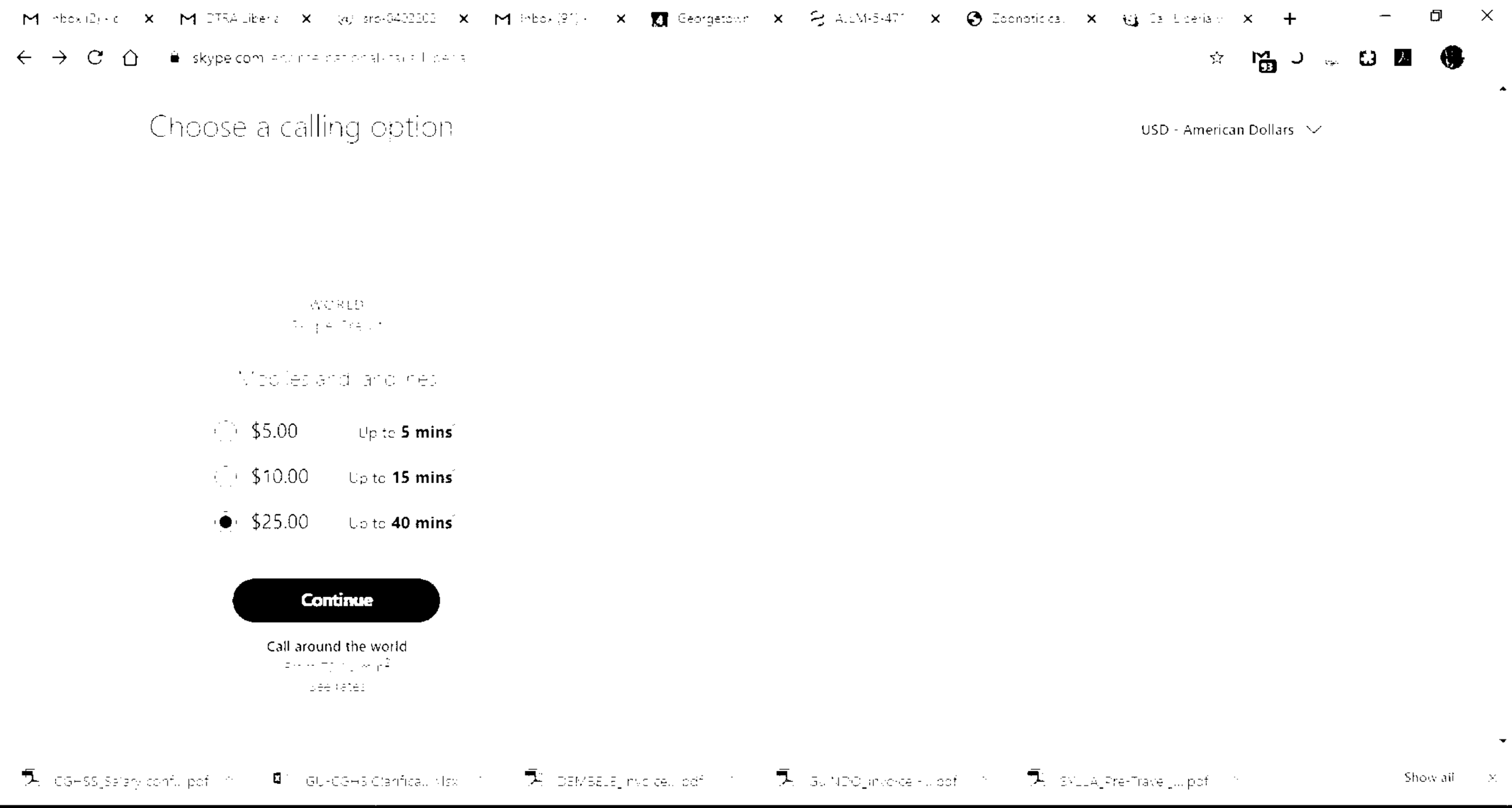
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- Use our **International Roaming checklist** to go over everything you need to know about using your phone abroad.
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  - You can turn on data by dialing **#RON#**.
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  - If you want to turn data back off. dial **#ROF#**.
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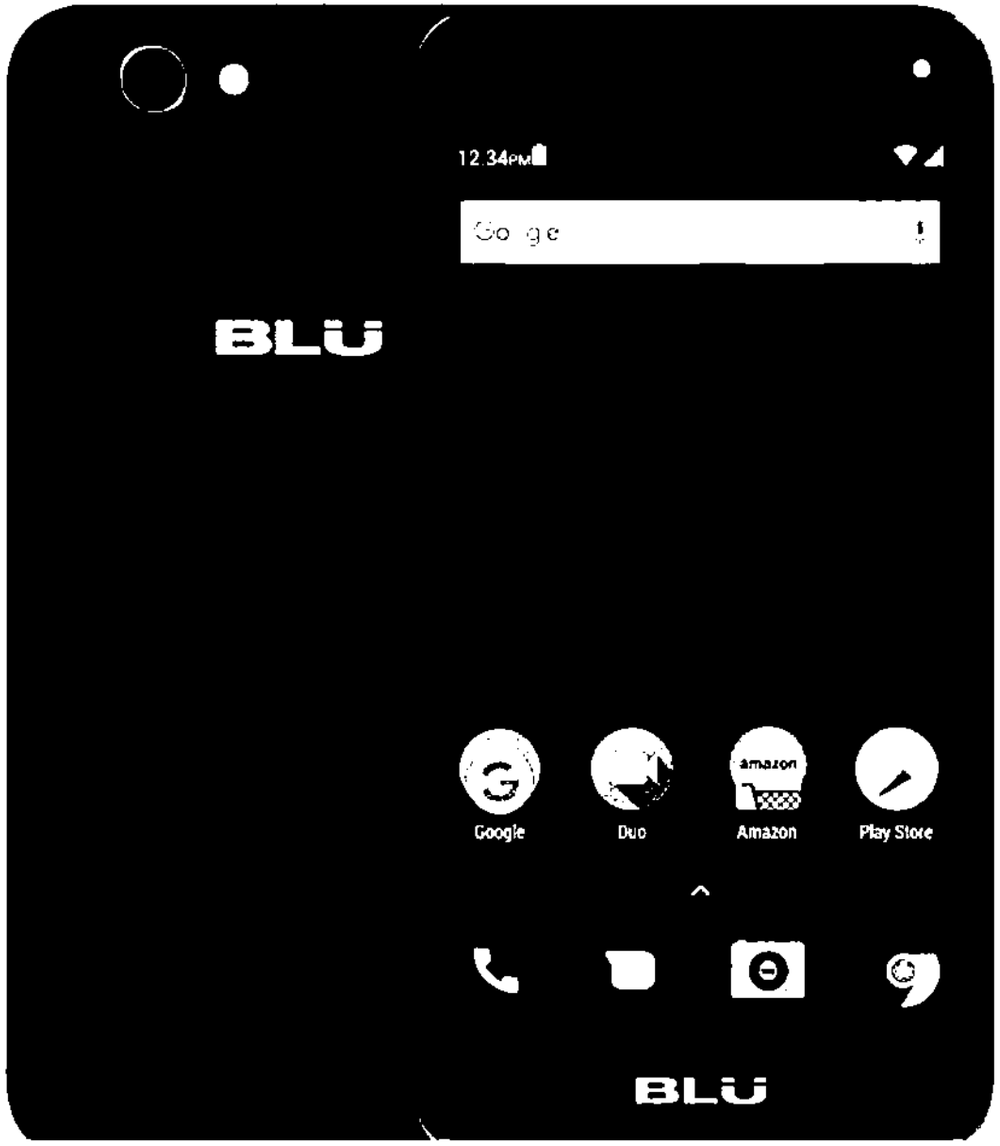


BLU Advance S5 HD – Unlocked Single Sim Smartphone, 16GB+1GB RAM - Black

by BLU

75 ratings | 32 answered questions

Amazon's Choice

for phones unlocked

Price: $49.99 prime FREE Same-Day

Get $70.00 instantly: Pay $0.00 $49.99 upon approval for the Amazon Prime Rewards Visa Card. No annual fee.

- Unlocked Single SIM smartphone, Android 8.1 Oreo (Go Edition)
- 5.0" HD Touchscreen Display
- 8MP Main Camera with flash + 5MP Selfie Camera with flash
- 16GB Internal memory 1GB RAM Micro SD up to 64GB, 1.3GHz Quad core processor with Mali-400 GPU
- GSM Quad band, 3G (850/1900) 4G LTE (4/5/7/28): Compatible with GSM networks. Not compatible with CDMA networks like Verizon, Sprint and Boost mobile.

Compare with similar items

Report incorrect product information

$49.99
prime FREE Same-Day

FREE delivery: **Today**
Order within 3 hrs 36 mins Details

Deliver to Washington 20002

In Stock.

Qty: 1

Add to Cart

Buy Now

Sold by BLU Products and Fulfilled by Amazon.

Add a Protection Plan:

Extend Your Screen Protection for $6.99

Add gift options

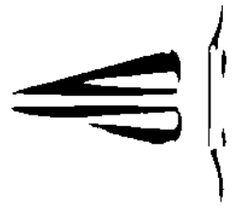
Add to your Dash Buttons

Learn more about Dash Buttons

Add to List

CG-S5_Safety confi... pdf | GU-CG-S Clarifica... docx | DEMSBLE_nvc ce... pdf | Su NDO_invoice -... pdf | SYLLA_Pre-Travel_... pdf | Show all

Dropbox | ENG INTL | 10:38 AM 05-Feb-20



Samsung BAR Plus 32GB - 200MB/s USB 3.1 Flash Drive Champagne Silver (MUF-32BE3/AM)

by Samsung

4,735 ratings | 268 answered questions

List Price: ~~$13.99~~

Price: $9.91 prime FREE Same-Day & FREE Returns

You Save: $4.08 (29%)

Free Amazon tech support included

Silver

32 GB

32 GB | 64 GB | 128 GB | 256 GB

- Redefine everyday file transfers with speeds up to 200MB/s
- Reliable and secure storage for your photos, videos, music, and files
- Rugged metal casing for durability with key ring to prevent loss
- Safeguard your data (Water proof, shock proof, magnet proof, temperature proof, x ray proof)
- USB 3.1 flash drive with backwards compatibility (USB 3.0, USB 2.0)

Compare with similar items

New (4) from $9.91 prime FREE Shipping

$9.91

prime FREE Same-Day & FREE Returns

Get FREE delivery **Today** if you order $35 of qualifying items within 7 hrs and 5 mins and choose this date at checkout.

Details

Deliver to Washington 20007

In Stock.

Qty: 1

Add to Cart

Buy Now

Ships from and sold by Amazon.com.

Add a Protection Plan:

2-Year Protect and Data Recovery Plan for $2.99

1-Year Protect and Data

LIBERIA CHIMPANZEE RESCUE AND PROTECTION
DOCUMENTATION TABLE OF CONTENTS

CONSULTANCY CONTRACT

NAME:	Dr. James S. Desmond
ADDRESS:	Liberian Institute for Biomedical Research Charlesville, Margibi County Liberia
REFERENCE LOG #:	P2Y5JDESMOND03
PROJECT TITLE:	PREDICT-2 Liberia (Ebola Host Project)
PERIOD:	01 OCTOBER 2018 30 SEPTEMBER 2019
PHONE:	+231 776 147 565
E-MAIL:	desmond@ecohealthalliance.org
FUNDING SOURCE:	07-306-7119-52039
CONTRACT AMOUNT:	US $146,000

Amendment to the Original Terms & Conditions:

Item 1 Agreement Amount is revised as follows:

a) delete $150, 203.16
b) replace with $150,727.15 to include 523.99 to cover additional Y5 expenses.

Item 2 – All other terms and conditions of this Subward Agreement that are not inconsistent with this Amendment remain unchanged and in full force and effect.

Dr. Peter Daszak
President, EcoHealth Alliance

DATE

Dr. James S. Desmond
Consultant

December 3, 2019
DATE

15

Bag

Computer (with AppleCare), mouse and keyboard unit: $2126 each

Here's what's in your bag.

Get free shipping and free returns on all orders.

Magic Keyboard - US English

5 ⌄ $495.00

Remove

Add a gift message Add

Order by 5pm, delivers:
Today within 2 hours - Fastest
Thu, Nov 7 - Free
Delivery options for: [redacted]

Pickup:
Today at Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray

1 ⌄ $1,699.00

Show product details ⌄ Remove

AppleCare+ for MacBook/MacBook Air $249.00
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: [redacted]

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

Magic Mouse 2 - Silver

5 ⌄ $395.00

Remove

NATIONAL PUBLIC HEALTH INSTITUTE OF LIBERIA
DOCUMENTATION TABLE OF CONTENTS

National Public Health Institute Of Liberia

Preventing and Controlling Public Health Threats

March 2, 2020

Eco Health Alliance
460 West 34 Street
17th Floor,
New York City
USA

Re: **Confirmation of Incentives to be paid Key and other personnel working on the DTRA Grants**

Dear Sir/Madam
I extend compliments as I write you this communication verifying salaries of Key personnel enlisted and budgeted for in the DETRA grant proposal.

The salaries proposed in the budget are percentages of their individual base salaries. The key staffs on the project will be working on a Full Time Equivalent bases.

Thanks so much for your kind consideration and please be assured that our office is willing at all times to provide you additional clarifications as may be required.

Best Regards,

Mr. Fidel D. Wiah
Deputy Director General for Administration (Acting)

Print Back

Printed from VWR Website
User: james Desmond
Date: 06-14-2019 Time: 12:51

Shipping Account Number: Ecohealth Alliance
80626633460 West 34th Street
17th Floor
New York ,NY
, 10001
United States
Edit Address

Shopping Cart

Item Subtotal : $29,884.66

Cart Preferences Save as a Shopping List Share Your Shopping Cart

This order has exceeded its Total Order Limit of $20,000.00.

Expand All / Collapse All

Standard Products

Update

STIRLING ULT FREEZER SU780XLE 120V/240V	**75845-814**	**Direct from Supplier**	**EA**	1	**$22,958.40**	**$22,958.40**	✕

SBE

Availability: **Shipped directly from GLOBAL COOLING, INC.**, If availability is critical, please call VWR Customer Support at 1 800 932 5000

Line Item Comments Search / Add a Value Use for all items in cart

Update Other

Charges:

LN2 BACK-UP SYSTEM FACTORY INSTALLED	**75846-036**	**Direct from Supplier**	**EA**	1	**$3,439.37**	**$3,439.37**	✕

SBE

Availability:- **Shipped directly from GLOBAL COOLING, INC.**, If availability is critical, please call VWR Customer Support at 1-800-932-5000

Line Item Comments Search / Add a Value

Charges:

SKELETON RACK SOLUTION 2 INCH BOXES	**75845-886**	**Direct from Supplier**	**EA**	1	**$3,486.89**	**$3,486.89**	✕

SBE

Availability:- **Shipped directly from GLOBAL COOLING, INC.**, If availability is critical, please call VWR Customer Support at 1-800-932-5000

Line Item Comments Search / Add a Value

Charges:

Expand All / Collapse All

Item Subtotal : $29,884.66

Have a promotion code?

Update

Apply Promotion Code

Build your cart from:

- Shopping Lists
- Frequently Ordered Items
- Upload Products to Cart

Please note that you will receive an order acknowledgment after order placement that contains updated product delivery information.

Choose File No file chosen Upload

Print Back

National Public Health Institute Of Liberia

Preventing and Controlling Public Health Threats

March 22, 2020

Dr. James Desmond
EcoHealth Alliance
460 West 34th Street
17th Floor,
New York City
USA

Re: Laboratory test cost confirmation

Dear Mr. Desmond

I am writing to confirm the laboratory testing costs associated with the project titled: *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

Based on an analysis of previous costs associated with testing biological samples in similar projects, we estimate a cost of $33.74 per sample.

Thanks so much for your kind consideration and please be assured that our office is willing at all times to provide you additional clarifications as may be required.

Best Regards.

Mr. Fidel D. Wiah
Deputy Director General for Administration (Acting)

BD Syringe with Sub-Q Needle

Syringe; Becton Dickinson;; With Sub-Q needle; 1mL, 26 gauge; Slip Tip; 100/Pk.

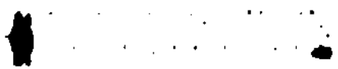
Manufacturer: BD 309597

Catalog No. 14-829-10F

$35.25 / Pack of 100

$213.21 / Case of 8 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.



BD Disposable Syringes with Luer-Lok™ Tips

Unique integrated BD Luer-Lok™ tip syringe with clear barrel. BD Medical™ Disposable Syringes with Luer-Lok™ Tips are sterile and disposable.

Manufacturer: BD 309657

◀ View more versions of this product

Catalog No. 14-823-435

$33.25 / Pack of 200

$98.88 / Case of 4 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.

BD Vacutainer™ Eclipse™ Blood Collection Needle

Provides fast, easy needle-tip protection. BD Vacutainer™ Eclipse™ Blood Collection Needle is a multi-sample blood collection needle with an integrated safety shield that offers a simple, effective way to collect blood while reducing the possibility of needle stick injuries.

Manufacturer: BD 368607

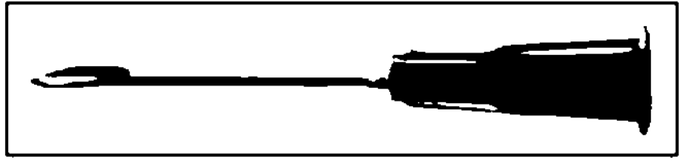
◀ View more versions of this product

Catalog No. 02-683-101

$42.55 / Pack of 48

$339.50 / Case of 10 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.



BD General Use and PrecisionGlide Hypodermic Needles

Fit any Luer-Lok™, slip tip, or eccentric tip syringe

Manufacturer: BD 305165

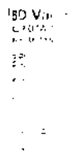
◀ View more versions of this product

Catalog No. 14-826C

$19.25 / Pack of 100

$150.38 / Case of 10 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.



BD Vacutainer™ Plastic Blood Collection Tubes with K_2EDTA: Hemogard™ Closure

Evacuated blood collection tubes for whole blood hematology determinations

Manufacturer: BD 367899

◀ View more versions of this product

Catalog No. 13-680-61

$43.30 / Pack of 100

$337.00 / Case of 10 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.

Puritan™ Polyester-Tipped Applicators

Ideal for specimen collection, testing and screening

Manufacturer: Puritan™ 25806 2PD

◀ View more versions of this product

Catalog No. 22-029-574

$30.00 / Pack of 200

$231.23 / Case of 10 PK

Qty Check Availability

Fisherbrand™ Extended Cuff Nitrile Exam Gloves

Choose a glove with exceptional durability and added protection. The Fisherbrand™ Extended Cuff Nitrile Gloves are extra-thick, fully textured for a superior grip and are tested for use with chemotherapy drug exposure.

$39.05

Specifications

Certifications/Compliance	ASTM D6319, FDA 21 CFR 177-2600, 10993-1 2003, FDA 510(k), Tested for use with chemotherapy drugs
Coating Material	Textured
Color	Teal
Length (English)	12 in.
Length (Metric)	30.5 cm

View More Specs

Thermo Scientific™ Nunc™ Biobanking and Cell Culture Cryogenic Tubes GSA/VA

Store samples from general cold storage to the vapor phase of liquid nitrogen with Thermo Scientific™ Nunc™ Biobanking and Cell Culture Cryogenic Tubes.

Manufacturer: Thermo Scientific™ 368632

◀ View more versions of this product

Catalog No. 12-565-171N

$546.00 / Pack of 450

$1,614.00 / Case of 4 PK

Qty Check Availability

BD Vacutainer™ Venous Blood Collection Tubes: Vacutainer Plus™ Plastic Serum Tubes, Silicone-Coated, with Conventional Stopper

Use for serum determinations in chemistry, serology and immunohematology

Manufacturer: BD 368660

◀ View more versions of this product

Catalog No. 23-021-012

$35.00 / Pack of 100

$281.19 / Case of 10 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.

Tablets and case: $228.98 each

Your order qualifies for FREE Shipping.
Choose this option at checkout. See details

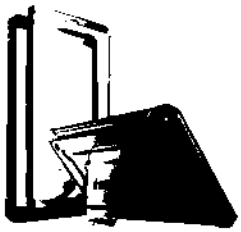
Subtotal (13 items): $1,225.87

This order contains a gift

Proceed to checkout

Shopping Cart

Price



SupCase Unicorn Beetle Pro Series Designed for Galaxy Tab A 10.1 (2019 Release), Full-Body Rugged Heavy Duty Protective Case with Built-in Screen Protector for Galaxy Tab A 10.1 Inch 2019 (Black) $26.99

In Stock
Eligible for FREE Shipping
This is a gift Learn more
Qty: 8 Delete Save for later
Compare with similar items

Samsung Galaxy Tab A 10.1 32 GB Wifi Tablet Black (2019) $201.99

In Stock
Eligible for FREE Shipping
Gift options not available. Learn more
Qty: 5 Delete Save for later
Compare with similar items

Note we will order 8, only 5 were allowed to be ordered at a time. This adds another $605.97 to the total

Subtotal (13 items): $1,225.87
Updated Subtotal (16 items): $1,831.84

The price and availability of items at Amazon.com are subject to change. The Cart is a temporary place to store a list of your items and reflects each item's most recent price. Learn more
Do you have a gift card or promotional code? We'll ask you to enter your claim code when it's time to pay.

Sponsored Products related to items in your cart

Fire HD 10 Case 2017... 26
$29.99
See all buying options

Galaxy Tab A 10.1 Case... 14
$16.99
See all buying options

Amazon Fire 7 Tablet... 1,625
$14.99
See all buying options

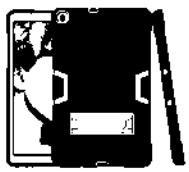
Soke Galaxy Tab A... 296
$19.99
See all buying options

Customers who shopped for SupCase Unicorn Beetle Pro Series Designed for... also shopped for:

Page 1 of 4

SupCase [Unicorn Beetle... 675
$26.99
Add to Cart

Galaxy Tab A 10.1 2019... 122
$26.95
Add to Cart



Cartis Galaxy Tab A 10.1"... 123
$13.99
Add to Cart

Gift ideas inspired by your shopping history

BD Vacutainer™ Tube Holder

Low-cost, single-use holder compliant with OSHA regulations

Manufacturer: BD 364815

Catalog No. 22-289-953

$23.05 / Pack of 250

$91.90 / Case of 4 PK

Due to product restrictions, please Sign In to purchase or view availability for this product.

SOCIETY FOR THE CONSERVATION OF NATURE OF LIBERIA (SCNL)

Tubman Boulevard, Congo Town, CARE Compound
P.O. Box 2628 Monrovia, Liberia, West Africa
☎ (+231)886-573-612/886-511-138
Website:www.scnlib.net
E-mail:scnliberia@yahoo.com

BirdLife Partner

BirdLife INTERNATIONAL

CHECK PAYMENT VOUCHER

NO.

Project (s): Predict Date: June 14, 2019

Pay to. Golden Gate (Liberia) Inc

Check Number: (b)(6)

Account Code	Budget code	Description payment or Narrative	Amount	
		Payment to Golden Gate (Liberia) Inc. to acquire workshop and catering service for the launch of the forest Health Futures Project on June 19, 2019	USD 2,255	00
Total			USD 2,255	00

Amount in words Two thousand two hundred fifty five united State dollars

Prepared by: Ma-Sue N. Koffa Date: June 14, 2019

Approved by: Comfort M. Freeman Date: June 14, 2019

Received by: Mufutau Ogunbowale Date: 17/06/19

Help Conserve Liberia's Natural Resources

利比里亚金门集团公司

GOLDEN GATE (LIBERIA) INC

S.K. Doe Sports Complex, Paynesville Tel: 0555111001 0770286700
Montserrado County, Monrovia, Liberia E-mail: goldengateli@gmail.com

28th May, 2019.

To: ECOHealth Alliance,

QUOTATION # 2019/0528/0916

DATE	DESCRIPTION	QTY	DURATION	RATE(USD)	OFFER(USD)
19th June, 2019	Breakfast, Lunch & 2 Coffee Break	50 Pers.	1 Day.	32/Pers	$1,600.00
	Hall	1	1 Day.	400/Day	$400.00
	Extra water	50		1/Bottle	$50.00
	10% GST				$205.00
TOTAL					$2,255.00

Amount in words: Two Thousand Two Hundred And Fifty Five United States Dollars Only.

GOLDEN GATE HOTEL

13362

17/06/2019

SCNL

Two Thousand Two Hundred and Fifty Five United States Dollars

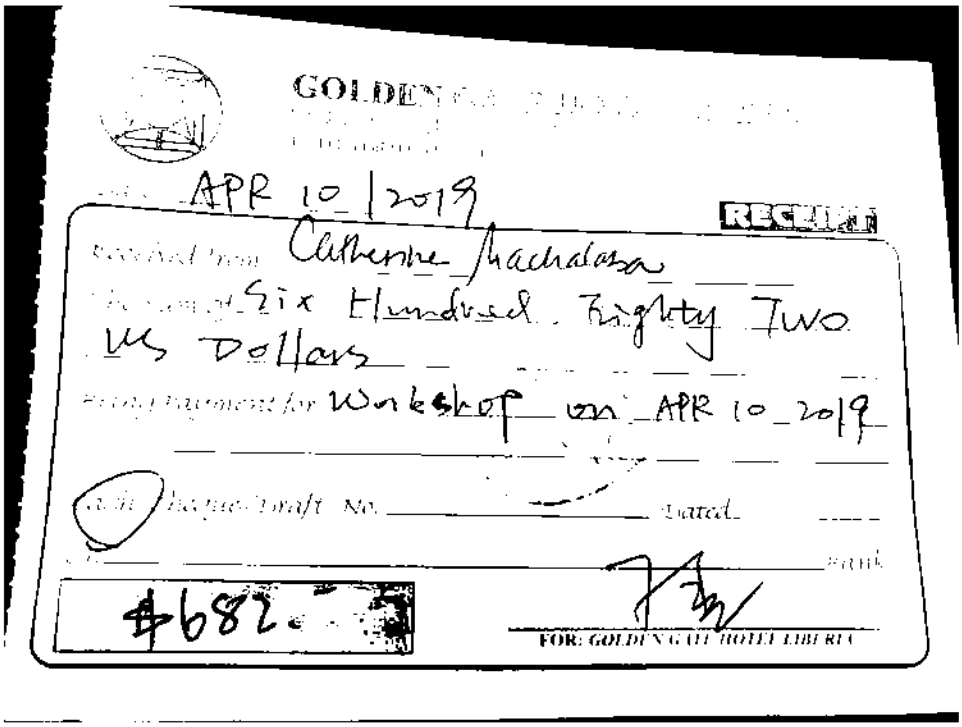
Workshop Invoice

14/06/19

00923713

ECOBANK

$2,255:00



GOLDEN

APR 10 2019

RECEIVED

Received from Catherine Machadorn

Six Hundred Eighty Two

US Dollars

For Payment for Workshop on APR 10 2019

Cash/Cheque/Draft No. _____ Dated _____

Bank _____

$682.

FOR GOLDEN GATE HOTEL LIBERIA

利比里亚金门集团公司

GOLDEN GATE (LIBERIA) INC

[illegible]

[illegible]

INVOICE #2019/0410/0944

DATE	DESCRIPTION	TOTAL(USD)
[illegible]	Tea Breakfast & Lunch (20)	$420.00
	Min. Conference Room	$200.00
	10% GST	$62.00
TOTAL		$682.00

Amount in words: Six Hundred And Eighty Two United State Dollars Only

SOCIETY FOR THE CONSERVATION OF NATURE OF LIBERIA
DOCUMENTATION TABLE OF CONTENTS

Society for the Conservation of Nature of Liberia (SCNL)

Tubman Boulevard, Congo Town, CARE Compound

P.O. Box 2628 Monrovia, Liberia, West Africa

(+231) 886-573-612/0777544611

Website: www.scnlliberia.org

E-mail: scnlliberia@yahoo.com

Birdlife Partner

Michael Garbo
Executive Director
Society for Conservation of Nature of Liberia
Congo Town, Monrovia

March 2, 2020

To: DTRA C-WMD Thrust Area 6 Program

This letter is intended to confirm the salary levels for following positions for the project, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia*: social scientist (1), field technician (3), field supervisor (1), driver (2), administrative assistant (1), accounting assistant (1).

Position	No. of Staff	Monthly Salary	Percent Covered	Annual Total
Social Scientist	1	$550.00	100%	$6,600.00
Field Technician	3	$550.00	100%	$19,800.00
Field Supervisor	1	$650.00	100%	$7,800.00
Administrative Asst.	1	$1,350.00	50%	$8,100.00
Accounting Asst.	1	$720.00	50%	$4,320.00
Driver	2	$330.00	100%	$7,290.00
Total	**9**	**$4150.00**	**NA**	**$54,540.00**

These salary levels are based on funding levels for previous projects of a similar nature, primarily the USAID funded PREDICT project. Please feel free to contact me if you have any questions or need additional information.

Sincerely yours,

Mr. Michael F. Garbo
Executive Director/SCNL

TOYOTA
GIBRALTAR STOCKHOLDINGS LTD
Agents for
Toyota Motor Europe NV/SA

20 ANNIVERSARY

TGS
MORE
THAN
JUST
CARS

P.O Box 176. 40 Dovi's Tower Road. Gibraltar
Tel: +350 200 59100 or +44 207 906 1745
Fax: +350 200 46262 or +44 208 090 3780
E-mail: sales@toyota-gib.com
www.toyota-gib.com

To	**Partners in Animal Protection and Conservation**
Attention	**James Desmond**
Subject	**Quotation**
Client Reference	**1 x HZJ79 SC - Liberia**
E-Mail	(b)(6)

Date: 8/05/2019
Our Ref: 144625
Account N°: (b)(6)

Dear Mr Desmond,

Thank you for your enquiry. We have pleasure in attaching our quotation as requested.

Freight Service Details - Consignment No 1 HZJ79L-TJMRS-A2

Shipped From	Gibraltar, Gibraltar
Destination	Monrovia, Liberia
Estimated Time of Sailing (ETS) Gibraltar	11/06/2019
Estimated Time of Arrival (ETA) Monrovia, Liberia	23/07/2019
Transit time in days	42
Costs	161,693 JPY
Frequency	Every 10 days
Freight Method	Monrovia, Liberia via Valencia RORO

Important Shipping Information

Alternate Routes Freight Service Details - Consignment No 1 HZJ79L-TJMRS-A2

Destination	Monrovia, Liberia
Estimated Time of Sailing (ETS) Gibraltar	11/06/2019
Estimated Time of Arrival (ETA) Monrovia, Liberia	30/06/2019
Transit time in days	19
Costs	227,332 JPY
Insurance	60,729 JPY
Frequency	Weekly
Freight Method	Monrovia, Liberia via Algeciras FCL
ALTERNATE ROUTE BATCH 1 TOTAL	4,919,031 JPY
ALTERNATE ROUTE INDICATIVE BATCH 1 TOTAL	45,547 USD

Important Shipping Information

Delivery

* Kindly note that the quoted ETS/ETA dates are subject to change and will be confirmed at the time of order. Shipping dates will depend on stock levels as well as on our workshop workload, both which change on a daily basis.

* If delivery is via Container, please note that off-loading and de-stuffing charges may apply at destination and are the responsibility of the buyer.

* Kindly also note that our vehicle stock is available on a first come first served basis and we recommend that you place your order as soon as possible to ensure availability.

Batch Summary

Batch 1 Summary	CIF Monrovia, Liberia via Valencia RORO (Incoterms 2010)	4,852,571	JPY
Batch 1 Summary		44,931.21	INDICATIVE USD

Vehicle & Fleet Insurance

TGS has partnered with the leading international insurance firm Clements, to offer its customers competitive world-wide insurance coverage specifically designed for Aid & Humanitarian organisations. Through this partnership, TGS can provide insurance cover on a global flat rate for your vehicle or fleet and includes towing, theft, rental reimbursements amongst other benefits, as listed below:

- Worldwide comprehensive cover
- A simple, fast and hassle-free claim procedure
- In addition to the physical damage cover, the policy may be adjusted to your needs and include optional modules (such as excess liability, political violence, personal accident, duty coverage)
- Customers will benefit from a unique premium discount structure if specific accessories or services are also purchased with your vehicle

P.O Box 176. 40 Dovi's Tower Road. Gibraltar
Tel: +350 200 59100 or +44 207 906 1745
Fax: +350 200 46262 or +44 208 090 3780
E-mail: sales@toyota-gib.com
www.toyota-gib.com

If interested, please contact us for additional information or request for quotation - [illegible]

Download a copy of our insurance flyer on this link - [illegible]

Incoterms
Batch 1: CIF
Under CIF terms, the buyer is responsible for customs clearance at destination.

Payment Terms
Bank transfer with order

Batch 1: Warranty Service - Liberia:36 Months or 100000 Kms (whichever comes first)
Full Toyota warranty and after-sales service is included in the price of the vehicles supplied by Toyota Gibraltar Stockholdings Ltd (TGS). It's important to note that unauthorised traders cannot offer Toyota approved in-country warranty and after-sales service. A free pre-delivery inspection (PDI) and the issue of the Toyota Warranty Booklet will be carried out by the local Toyota Distributor. Please note that the local Toyota Distributor may charge for the installation of unassembled accessories, such as roof rack(s). The Distributor will also carry out a 1000 Km service check, free of charge except for lubricants, fluids or filters used, and will arrange the application of warranty if necessary. Please note that non-Toyota equipment fitted as a TGS option is not endorsed by Toyota and consequently shall not benefit from the Toyota warranty and warranty service. This non-Toyota equipment will be separately warranted by TGS who will match the conditions of the warranty of the original manufacturer. It is important that the Pre-Delivery Inspection is carried out by the Toyota Distributor before the vehicle is put into operational use.

Batch 1: Warranty Service - Note
Please note that any spare parts purchased from TGS may not be accepted or used by the local distributor during routine maintenance or servicing of your vehicle(s) at their premises.

Batch 1 - The Main Official Toyota Distributor is located in Monrovia

Validity
Prices are valid until the **7th June 2019**. this does not include indicative prices provided in alternative currencies). Please note that the freight price is only valid for the number of vehicles quoted. Any changes in quantities will require a revised quotation.

Spare Parts Service
We have enclosed details of Spare Parts Packages available for each model. Please note the service package is shown with and without tyres; the maintenance package includes tyres as standard. Please also note that when spare parts are shipped with vehicles, considerable savings can be made as the parts will be freighted inside the vehicle free of charge to the final destination.
We hope that our quotation is of interest and look forward to hearing from you. Should you have any queries or require more information, please do not hesitate to contact us quoting our reference.

Yours sincerely

Sylvie Dyos
Sales Executive
Direct Line: +35020059183
E-Mail: Sylvie.dyos@toyota-gib.com

TOYOTA
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Agents for
Toyota Motor Europe NV/SA

20 ANNIVERSARY

TGS MORE THAN JUST CARS

P.O Box 176. 40 Devil's Tower Road. Gibraltar
Tel: +350 200 59100 or +44 207 906 1745
Fax: +350 200 46262 or +44 208 090 3780
E-mail: sales@toyota-gib.com
www.toyota-gib.com

Land Cruiser 79 Single Cabin Pick-Up, 3 seater (Airbags, Air Conditioning, ABS), Model: HZJ79L-TJMRS SFX: A2

General Specifications (For use in extreme climatic and physical conditions)

Transmission	5 speed, Manual. Brakes: Front: Disc, Rear: Drum
Drive Type:	4x4
Tyres	Radial Front: 7.50R16-8 5.50F Rear: 7.50R16-8 5.50F. Steel
Suspensions	Front: Coil, Rear: Leaf
Wheelbase	LWB 3180 mm, Ground Clearance: 235 mm
Weight	Kerb Weight: 2140kg, Gross Vehicle Weight: 3200kg, Payload: 1060kg
Seats	3 Seater. Front: 1+2 Bench, Rear: - . Material: Vinyl
Dimensions	Length: 5195mm, Width: 1790mm, Height: 1975mm, Volume: 18.4m³ all excluding accessories
Colour	White
Country of Origin	Japan
Engine Model	1HZ - 4164cc, Diesel(Tank 90+90l), 6 cylinders, BHP: 129, KW: 96, Cooling (Water), electrics 12 Volts
No of doors	2

Standard Features:

Engine & Chassis
Air Cleaner: cyclone with snorkel
Battery: 65 amp-hour battery (12v)
Battery: 80D26 (12V)
Brake control valve (Load Sensing Pressure Valve)
Differential - rear 4.300 4P
Engine oil cooler
Fuel sedimenter w/fuel filter
Full-floating rear axle
High altitude compensator
Power steering
Stabiliser bar - front & rear
Transfer box protection

Exterior
Antenna
Bumper
Deck guard frame
Drop-down tail-gate with TOYOTA mark
High/Low 2-speed windshield wipers (inc. mist)
Lockable fuel cap
Mud guards: front & rear
Outside rear view mirror - Door
Rear step bumper
Semi-sealed halogen headlamps
Side steps
Towing hook: front (eye) with rear pintle hook
Windshield - green laminated

Interior
Air cleaner warning
Ashtray
Assist grips x 3
Bottle Holder (Front) + Back Panel (Pick-Up)
Brake fluid level warning
Cigarette lighter
Clock: digital
Dash silencer (interior only)
Door ajar warning
Floor mats: rubber mat (FR: D+P)
Floor silencer (under front seat)
Footrest - Driver
Fuel gauge
Fuel level warning light
Glove box: w/o lock
Headrests x 2
Heater: front
Interior light: centre
Interior rear view mirror (day and night)
Odometer: digital
Oil pressure warning light
One touch 2-4WD selector (H4 button)
Parking brake warning light
Pre-wiring for audio with 2 speakers and antenna
Seat belts: front x 3 (2 x 3 point & 1 x 2 point)
Speedometer km/h
Steering column-Tilt & Telescopic & Collapsible
Steering wheel lock
Sub fuel gauge
Sub fuel tank switch
Sun visors (D&P)
Timing belt replacement warning light
Transfer - 4WD lever & knob
Trip Meter
Vinyl floor covering
Voltage meter warning light
Water temperature gauge

Miscellaneous
Owner's manual - English
Owner's manual - French
Tool Kit & Jack

Security & Safety
Anti-lock braking system (ABS)
Central door locking w/ remote

Tyres
Spare wheel carrier: deck guard frame. w/lock

Basic Price	Ex-Works Gibraltar, Standard Vehicle	2,835,000	JPY

Factory Options Included In Price

Airbags / Driver & Front passenger
Air conditioning (non-CFC)
ABS Brakes

TGS Options

2nd battery with split diode and battery holder	110,800
Fuel pre-filter kit (incl. 2x spare filters) (W/SECOND BATTERY OPTION ONLY)	39,500
Supply 5x FS1001 Fleetguard spare diesel fuel filters	17,400
Pioneer AM, FM radio-cd, MP3 player, bluetooth, AUX jack & USB (remov.front)	25,600
Basic safety pack (Exting./Triangles/First A.Kit/Rope/Vest/Solar Flashlight	15,700
Emergency escape tool, USB charger	2,100
Set of locking wheel nuts (not fitted)	4,600
Transit safety box (to secure easily removable items)	22,100
2nd spare wheel - Michelin XS 750R16 (sand tyre)	50,700
Change tyres to Michelin XS 750R16 sand tyre	91,900
Original carrier extension for 2nd spare wheel (750R16)	5,300
Vinyl spare wheel cover with TGS logo	0
Axle (front and rear) and gearbox breather extension kit	20,700
Recovery point (fitted at the front)	28,900
Vehicle tool kit (7-piece tool kit/booster cables/solar flashlight/gloves)	41,600
12V LED Worklamp wih magnetic base	14,400
20L moulded plastic jerry can (diesel) with flexible spout	10,900
Electric 12V winch with synthetic rope and heavy duty bull bar	238,900
Front windscreen repair kit	2,300
High lift jack 120cm incl. fitting inside the cargo bed	38,600
Jerry can holder (single), externally mounted in load area	18,300
Platform for the high lift jack	9,500

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	Pneumatic differential lock FR+RR incl. pump up kit 6m & air pressure gauge	428,300		
	Rear white PVC canopy with stainless steel frame and rear windows	154,300		
	Replacement rear bumper bar LC79, inc. Hi-Lift jacking points	125,500		
	Winch recovery accessories in storage bag	40,700		
TGS Options Total Price			1,558,600	JPY
Sub-Total Price	per unit		4,393,600	JPY
Parts packages included				
	HZJ79L-DK-TJMRS Service Pack HZJ79L-DK-TJMRS Serv. Pack		237,370	JPY
Freight	Monrovia, Liberia via Valencia RORO		161,693	JPY
Insurance	Please note that all claims have an Excess Clause (Deductable) applied. This means that the first £1,200 (or equivalent) of a claim is not payable by the insurance company.		59,908	JPY
Total Unit Price			4,852,571	JPY
Grand Total	**1 Unit CIF Monrovia, Liberia via Valencia RORO (Incoterms 2010)**		**4,852,571**	**JPY**
Grand Total	**1 Unit CIF Monrovia, Liberia via Valencia RORO (Incoterms 2010)**		**44,931.21**	**INDICATIVE USD**

Stock Availability

HZJ79L-TJMRS-A2 Availability: In Stock: 58 Units, MAY: 15 Units, JUN: 8 Units.

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HZJ79L-DK-TJMRS Service Pack HZJ79L-DK-TJMRS Serv. Pack for HZJ79L-TJMRS-A2

Item	Description	Qty	Unit Price	Price
1	AIR FILTER	5	5,905	29,525
2	BRAKE FLUID DOT4 1L	2	1,829	3,658
3	BULB KIT H4 - TYPE1 KIT: H4	1	1,420	1,420
4	COOLANT 1L LLC CONCENTRATE	1	1,166	1,166
5	COOLER COMPRESSOR BELT	1	1,908	1,908
6	ENGINE OIL 15W40 5L	5	3,106	15,530
7	FAN & ALTERNATOR BELT	1	1,811	1,811
8	FLAP INNER-TUBE 750R16	4	1,440	5,760
9	FRONT BRAKE DISC PADS KIT	1	14,883	14,883
10	FRONT WIPER BLADE (LEFT)	2	2,101	4,202
11	FRONT WIPER BLADE (RIGHT)	2	1,943	3,886
12	FUEL FILTER	8	4,812	38,496
13	INNER TUBE 750R16	4	2,166	8,664
14	OIL FILTER	10	2,367	23,670
15	OIL SUMP PLUG GASKET	10	129	1,290
16	RADIATOR HOSE NO.1	1	2,206	2,206
17	RADIATOR HOSE NO.2	1	2,060	2,060
18	TYRE DUNLOP QUALIFIER TG21 750R16C 114/112S RBL TT	4	29,496	117,984
19	WINDSCREEN WASHER FLUID CONCENTRATE -50 C 0.25L	5	228	1,140

Total:	279,259
Discount 15%	41,889
Total: JPY	**237,370**
Total: INDICATIVE USD	**2,197.87**

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TGS Workshop Fitted Options

HZJ79L-TJMRS-A2 - A2, Land Cruiser 79 Single Cabin Pick-Up, 3 seater (Airbags, Air Conditioning, ABS)

This is a partial list of the most frequently requested Options and Accessories that can be fitted by our Workshop. Most of these items are held in stock, but please check availability with our sales team prior to confirming your order. If an item that you require does not appear on this list, we will be happy to provide a full quotation on request.

IMPORTANT: Please note that the estimated shipment date may be affected if any further options are required other than those quoted. This would depend upon the number and type of options chosen, so please contact our sales team for further information.

Description		Price	
Options Category: Protection equipment			
SB8	8 x lap Type Seat Belts (Only to be used with JUM4 Option)	42,100	JPY
SG8	Aluminium 8mm skid plate LC70 series	46,400	JPY
FLP	Front acrylic light protectors	10,200	JPY
MB	Mesh barrier for factory deck guard LC79	58,100	JPY
RLP	Rear light protectors	16,300	JPY
REVCAM	Reversing camera & monitor system	78,300	JPY
EX1	1kg fire extinguisher, including fitting	5,200	JPY
SAFETY	Basic safety pack (Exting./Triangles/First A.Kit/Rope/Vest/Solar Flashlight	15,700	JPY
EET	Emergency escape tool, USB charger	2,100	JPY
HAMMER	Escape hammer for breaking side glass, inc. seat belt cutter	6,300	JPY
VEST	High visibility vest	500	JPY
REVBUZ	Reversing buzzer 97dB(A) @ 1m	17,200	JPY
BULSMT	SRS Heavy duty black smart bull bar including front bumper	185,600	JPY
BUL	SRS Heavy duty bull bar including front bumper	117,500	JPY
UJP	Universal joint protection, front and rear	58,800	JPY
TRI	Warning triangle	800	JPY
Options Category: Recovery & towing equipment			
JUMP	Heavy-duty jump leads	15,600	JPY
RRBTOW	50mm tow ball (REQUIRES REPLACEMENT REAR BAR)	14,600	JPY
AIR	Air jack (4,000kg rated)	52,400	JPY
BOGSTP	All terrain vehicle mobility bog strips	88,100	JPY
JACK	Bottle Jack 5tonne telescopic	9,800	JPY
RRBUNI	Combined ball & pin coupling (REQUIRES REPLACEMENT REAR BAR)	47,300	JPY
WIB6	Electric 12V winch with synthetic rope and heavy duty bull bar	238,900	JPY
SANDTR	Flexible sand tracks (1 pair)	22,800	JPY
SHOVEL	Folding shovel	8,400	JPY
WINHND	Hand winch (2400kg pull, 1600kg lift) + 20m rope	43,000	JPY
HIJ	High lift jack 120cm incl. fitting inside the cargo bed	38,600	JPY
HIJLFTMT	Lifting adapter for Hi-Lift jack	8,200	JPY
HIJBAS	Platform for the high lift jack	9,500	JPY
RECOV2	Recovery kit for recovery point in storage bag	15,700	JPY
RECOVTR	Recovery tracks (1 pair)	30,900	JPY
ROPE	Tow rope, 3000Kg rolling load capacity.	4,700	JPY
RECOV	Winch recovery accessories in storage bag	40,700	JPY
RECOVPFR	Recovery point (fitted at the front)	28,900	JPY
RECOVPRR	Recovery point (fitted at the rear)	35,200	JPY
Options Category: 4x4 equipment			
LAMPLED	12V LED Worklamp wih magnetic base	14,400	JPY
FOG2	2 x 55W fog lamps (ONLY WITH BULL BAR OPTION)	36,600	JPY
JERFUEL	20L moulded plastic jerry can (diesel) with flexible spout	10,900	JPY
JERWAT	20L moulded plastic water jerry can	5,600	JPY
SPO3	2x 100W rectangular spot/driving lights (ONLY WITH BULL BAR OPTION)	57,100	JPY
SPO3	2x 100W rectangular spot/driving lights (ONLY WITH SMART BAR OPTION)	64,000	JPY

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SPO2	2x 65W round spot lights (ONLY WITH BULL BAR OPTION)	52,900	JPY
LAMPINS1	Cordless LED rechargeable inspection lamp	4,000	JPY
WIBSMT2	Electric 12V winch with synthetic rope fitted onto SRS Smart bull bar	316,600	JPY
WL3	Flashing LED warning lights blue (pair) at the front	44,100	JPY
JEHDF	Jerry can holder (double), externally mounted	16,900	JPY
HRR	Heavy duty roof rack (NOT FITTED)	65,000	JPY
JEHD	Jerry can holder (double), extern. mountable (Not fitted)	11,900	JPY
JEH	Jerry can holder (single), externally mounted in load area	18,300	JPY
JEH2	Jerry can holder (single), roof rack mountable	8,300	JPY
DIFFRRPKT	Pneumatic differential lock (rear only) incl. pump up kit 6m & air pressure gauge	236,600	JPY
DIFFPKT	Pneumatic differential lock FR+RR incl. pump up kit 6m & air pressure gauge	428,300	JPY
TAR	Rear white PVC canopy with stainless steel frame and rear windows	154,300	JPY
RRBAR	Replacement rear bumper bar LC79, inc. Hi-Lift jacking points	125,500	JPY
TORCH	Solar flashlight	2,300	JPY
GPS64	Garmin GPSMAP 64 navigator with dashmount & 12V socket adapter	49,600	JPY
MAP	Map lamp on 195mm flexible fitting	19,600	JPY
MAGLIT	Rechargeable MagLite torch (NOT FITTED)	25,500	JPY
ROLBAR	Hi-over bar	128,100	JPY
AXLBRE	Axle (front and rear) and gearbox breather extension kit	20,700	JPY
GTK	Garage tool kit with 21 assorted tools	78,500	JPY
VTK	Vehicle tool kit (7-piece tool kit/booster cables/solar flashlight/gloves)	41,600	JPY
WTK	Workshop tool kit	153,600	JPY
Options Category: Tyres & accessories			
SWC	Roof rack mountable carrier for 2nd spare wheel	9,300	JPY
TYRPG	Tyre air pressure gauge	1,700	JPY
COMP	12v air compressor (fitted) w/tyre inflator kit & gauge	74,500	JPY
LEVER	2 x tyre levers 60cm long.	9,600	JPY
SW1	2nd spare wheel - Michelin XS 750R16 (sand tyre)	50,700	JPY
SWZ	2nd spare wheel as per standard specs. (Dunlop)	50,100	JPY
TYM	Change tyres to Michelin 7.50R16 4X4 O/R XZL (MUD)	100,000	JPY
TYX	Change tyres to Michelin AGILIS HD 750R16	89,600	JPY
TYS	Change tyres to Michelin XS 750R16 sand tyre	91,900	JPY
PUNTUB	Inner tube repair kit	1,500	JPY
STIRUP	Manual air pump with manometer	19,500	JPY
SWC2	Original carrier extension for 2nd spare wheel (235/85R16)	5,600	JPY
SWC2	Original carrier extension for 2nd spare wheel (750R16)	5,300	JPY
COMKIT	Portable 12V air compressor kit - incl. inflation kit	49,100	JPY
SNO	Snow chains 750x16 (2 pairs)	48,800	JPY
Options Category: Communications			
BRK	Antenna bracket for Codan radio (w/o bull bar) (SRS airbag compatible)	38,100	JPY
CODCLM	Codan CALM option (requires a Codan radio)	158,100	JPY
CODENV1	Codan HF mobile radio Envoy X1 with 3040 antenna, 100 channels	599,200	JPY
CODENV2	Codan HF mobile radio Envoy X2 with 3040 antenna, 1000 channels	729,300	JPY
NVIS2	Codan NVIS 3040 antenna kit (placed inside the vehicle)	51,400	JPY
GPSENB	Enable GPS capability (CODAN Envoy)	34,000	JPY
CODTPS	Envoy programming software including USB & memory stick cables	52,700	JPY
GPSENV	GPS receiver/antenna for Codan Envoy/NGT SRx radio (Fitted)	83,900	JPY
SATIRD1	Iridium PTT 9575 Extreme satellite phone with vehicle docking adapter (NO SIM CARD)	443,900	JPY
VHFDM1	Radio VHF Motorola DM4601, 1,000 channels, 1-25W, 136-174MHz w/keypad	141,200	JPY
Options Category: General equipment			
BEDAL1	Aluminium bed liner (floor and tailgate only)	229,500	JPY
JUM4	Supply and fit 4 inward facing folding seats for 8 persons	195,800	JPY
FILTFG	Fuel pre-filter kit (incl. 2x spare filters)	53,000	JPY
FILTFGB	Fuel pre-filter kit (incl. 2x spare filters) (W/SECOND BATTERY OPTION ONLY)	39,500	JPY
FLAGPO	Flag pole holder mounted on the passenger side of vehicle	15,400	JPY
WRK	Front windscreen repair kit	2,300	JPY
RCDP	Pioneer AM, FM radio-cd, MP3 player, bluetooth, AUX jack & USB (remov.front)	25,600	JPY
COOL14	Portable cool box 14L, 12V	21,600	JPY
SECFI	Seat covers LC79 Scb LHD 3 seater (fitted)	27,100	JPY

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JUM4	Supply and fit 4 inward facing folding seats for 8 persons	0	JPY
CASE1	Aluminium case	7,500	JPY
FLAGM	Ambassador magnetic flag holder	11,500	JPY
OWF	Owner's manual in French	4,400	JPY
WSMCDE	Repair manual in English CD format HZJ7# 08/2014>	53,800	JPY
Options Category: Ambulance			
WRAP	Emergency First Aid blanket	1,200	JPY
FAK	First aid kit, recommended by British Red Cross	1,400	JPY
RB	Rescue blanket 150x200cm	2,900	JPY
Options Category: Power solutions			
BATIBS	2nd battery with IBS battery management and battery holder	148,300	JPY
BAT	2nd battery with split diode and battery holder	110,800	JPY
BATT	Battery reinforcement (for factory battery)	8,200	JPY
POWERPACK	Emergency vehicle power pack 12V/200HP	158,600	JPY
SOCKRR	12V 2nd lighter socket mounted in rear	21,000	JPY
WINISO	Isolator Switch, Winch	14,700	JPY
INVER	Power Inverter 600W (12V D/C to 220V A/C)	35,100	JPY
Options Category: Packages			
RECOVPE	Recovery package (electric)	0	JPY
RECOVPM	Recovery package (manual)	0	JPY
SANDP	Sand package	0	JPY
VEP	Vehicle Emergency package	0	JPY
VSP	Vehicle security package	0	JPY
Options Category: Fleet Management			
TRACKHYB	Global Satellite and GSM Vehicle Tracking Device 2226 (with non-activated SIM card)	155,600	JPY
TRACKPORT	Global GSM Portable Vehicle Tracking Quick-Fit Device 6731 (with activated SIM card)	31,300	JPY
TRACKGSM	Global GSM Vehicle Tracking Device 6141 (with non-activated SIM card)	58,500	JPY
TPMPOR1	Tracpoint monthly fee and portable GSM Quick-Fit subscription package (1 year)	39,900	JPY
TPMGSM1	Tracpoint online management software (including security) and GSM subscription package (1st year) <100 assets	47,700	JPY
TPMGSM2	Tracpoint online management software (including security) and GSM subscription package (1st year) >100 assets	42,100	JPY
TPMHYB1	Tracpoint online management software (including security) and HYBRID subscription package (1st year) <100 assets	90,500	JPY
TPMHYB2	Tracpoint online management software (including security) and HYBRID subscription package (1st year) >100 assets	84,900	JPY
TPSGSM1	Tracpoint online security software and GSM subscription package (1st year) <100 assets	44,000	JPY
TPSGSM2	Tracpoint online security software and GSM subscription package (1st year) >100 assets	38,400	JPY
TPSHYB1	Tracpoint online security software and HYBRID subscription package (1st year), <100 assets	86,800	JPY
Options Category: Security equipment			
GZVSG1	Vehicle Security Grille - Front Windscreen, headlights & taillights	138,200	JPY
FOGF	Fog lamps for factory LC70 series front bumper	88,000	JPY
RLB	External roll cage, 6 point fixing	559,400	JPY
IMMOB	Ignition immobiliser key switch.	12,500	JPY
MUL	MUL-T-LOCK transmission (gear) lock	44,200	JPY
ALM	Remote control alarm with siren and engine immobilizer	69,800	JPY
NUT	Set of locking wheel nuts (not fitted)	4,600	JPY
TUBO	Steering wheel lock "FURBOLOCK" - theft deterrent	9,000	JPY
LOC	Steering wheel/pedal lock	6,300	JPY
TSB	Transit safety box (to secure easily removable items)	22,100	JPY
ETCH	Window etching on all vehicle windows (maximum 7 figures)	21,300	JPY
KEYMASTER	Additional Master Key 70#	4,600	JPY
KEYSUB	Additional Sub Key 70#	5,100	JPY
KEYTRANS	Transmitter, Door Control 70#	30,700	JPY
Options Category: Decals			
CROBLUS	Blue Cross on White Background on Front Doors & Bonnet	9,800	JPY
Options Category: Customized Option			

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GZMCP	MOBILE COMMAND POST CONVERSION LC79 SCB	3,772,900	JPY
CONV2	Personnel Carrier - Conversion LC79 Scb	0	JPY

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TGS Compatible Parts Packages

TGS recommends the following genuine spare parts but if you require greater or lesser amounts of any of the parts mentioned, or wish to change specific parts, we are entirely flexible and will tailor the package to your exact instructions.

HZJ79L-TJMRS (ABS + DRUM) Maintenance Pack: HZJ79L-TJMRS (ABS + DRUM) Maint. Pack for HZJ79L-TJMRS-A2 - A2

This Spare parts Package contains parts which are required for normal maintenance requirements during the first two years or 50,000kms of ownership. In addition it contains a comprehensive selection of emergency parts.

Item	Description	Qty	Unit Price	Price
1	ABSORBER, SHOCK, FR	2	7,725	15,450
2	ABSORBER SET, SHOCK,	2	7,699	15,398
3	GASKET KIT, ENGINE	1	13,668	13,668
4	SHOE KIT, BRAKE, RR	1	15,371	15,371
5	FRONT/REAR AXLE HUB SEAL	2	2,443	4,886
6	OIL SUMP PLUG GASKET	10	129	1,290
7	WINDSCREEN WASHER FLUID CONCENTRATE -50 C 0.25L	5	228	1,140
8	CLUTCH RELEASE CYLINDER REPAIR KIT	1	2,855	2,855
9	FRONT BRAKE DISC PADS KIT	1	14,883	14,883
10	ENGINE OIL 15W40 5L	5	3,106	15,530
11	ENGINE COOLANT LIQUID CONCENTRATE 5L	1	4,345	4,345
12	CYLINDER HEAD COVER GASKET	1	1,730	1,730
13	WATER PUMP	1	16,780	16,780
14	THERMOSTAT GASKET	1	435	435
15	RADIATOR HOSE NO.1	1	2,206	2,206
16	RADIATOR HOSE NO.2	1	2,060	2,060
17	EXHAUST CUSHION	4	1,028	4,112
18	AIR FILTER	5	5,905	29,525
19	GLOW PLUG	6	3,512	21,072
20	INJECTOR NOZZLE	6	9,338	56,028
21	WHEEL 5.50F-16 TYPE H STEEL LC70	1	23,111	23,111
22	STEERING DAMPER	1	26,719	26,719
23	FRONT WIPER BLADE (RIGHT)	2	1,943	3,886
24	FRONT WIPER BLADE (LEFT)	2	2,101	4,202
25	REAR AXLE SHAFT OIL SEAL (LEFT/RIGHT)	2	579	1,158
26	OIL FILTER	10	2,367	23,670
27	FAN & ALTERNATOR BELT	1	1,811	1,811
28	THERMOSTAT	1	4,567	4,567
29	WHEEL NUT	10	666	6,660
30	COOLER COMPRESSOR BELT	1	1,908	1,908
31	BULB KIT H4 - TYPE1 KIT: H4	1	1,420	1,420
32	BRAKE FLUID DOT4 1L	2	1,829	3,658
33	FUEL FILTER	8	4,812	38,496
			Total:	380,030
			Discount 15.00%	57,005
			TOTAL: JPY	**323,025**
			Total: INDICATIVE USD	**2,991.00**
34	FLAP INNER-TUBE 750R16	1,440	4	5,760
35	TYRE DUNLOP QUALIFIER TG21 750R16C 114/112S RBL TT	29,496	4	117,984
36	INNER TUBE 750R16	2,166	4	8,664
			Total:	132,408
			Discount 15.00%	19,861
GRAND TOTAL including tyres			**TOTAL: JPY**	**435,572**
			Total: INDICATIVE USD	**4,033.00**

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www.toyota-gib.com

HZJ79L-DKMRS (ABS + DRUM) Maintenance Pack: HZJ79L-DKMRS (ABS + DRUM) Maint. Pack for HZJ79L-TJMRS-A2 - A2

This Spare parts Package contains parts which are required for normal maintenance requirements during the first two years or 50,000kms of ownership. In addition it contains a comprehensive selection of emergency parts.

Item	Description	Qty	Unit Price	Price
1	ABSORBER, SHOCK, FR	2	7,725	15,450
2	ABSORBER SET, SHOCK,	2	7,699	15,398
3	FRONT/REAR AXLE HUB SEAL	2	2,443	4,886
4	SHOE KIT, BRAKE, RR	1	15,371	15,371
5	GASKET KIT, ENGINE	1	13,668	13,668
6	WINDSCREEN WASHER FLUID CONCENTRATE -50 C 0.25L	5	228	1,140
7	CLUTCH RELEASE CYLINDER REPAIR KIT	1	2,855	2,855
8	FRONT BRAKE DISC PADS KIT	1	14,883	14,883
9	ENGINE OIL 15W40 5L	5	3,106	15,530
10	ENGINE COOLANT LIQUID CONCENTRATE 5L	1	4,345	4,345
11	CYLINDER HEAD COVER GASKET	1	1,730	1,730
12	WATER PUMP	1	16,780	16,780
13	THERMOSTAT GASKET	1	435	435
14	RADIATOR HOSE NO.1	1	2,206	2,206
15	RADIATOR HOSE NO.2	1	2,060	2,060
16	EXHAUST CUSHION	1	1,028	1,028
17	AIR FILTER	5	5,905	29,525
18	GLOW PLUG	6	3,512	21,072
19	INJECTOR NOZZLE	6	9,338	56,028
20	WHEEL 5.50F-16 TYPE H STEEL LC70	1	23,111	23,111
21	STEERING DAMPER	1	26,719	26,719
22	FRONT WIPER BLADE (RIGHT)	2	1,943	3,886
23	FRONT WIPER BLADE (LEFT)	2	2,101	4,202
24	OIL SUMP PLUG GASKET	10	129	1,290
25	REAR AXLE SHAFT OIL SEAL (LEFT/RIGHT)	2	579	1,158
26	OIL FILTER	10	2,367	23,670
27	FAN & ALTERNATOR BELT	1	1,811	1,811
28	THERMOSTAT	1	4,567	4,567
29	WHEEL NUT	10	666	6,660
30	COOLER COMPRESSOR BELT	1	1,908	1,908
31	BULB KIT H4 - TYPE1 KIT: H4	1	1,420	1,420
32	BRAKE FLUID DOT4 1L	2	1,829	3,658
33	FUEL FILTER	8	4,812	38,496
			Total:	376,946
			Discount 15.00%	56,542
			TOTAL: JPY	**320,404**
			Total: INDICATIVE USD	**2,967.00**
34	FLAP INNER-TUBE 750R16	1,440	4	5,760
35	TYRE DUNLOP QUALIFIER TG21 750R16C 114/112S RBL TT	29,496	4	117,984
36	INNER TUBE 750R16	2,166	4	8,664
			Total:	132,408
			Discount 15.00%	19,861
GRAND TOTAL including tyres			**TOTAL: JPY**	**432,951**
			Total: INDICATIVE USD	**4,009.00**

Society for the Conservation of Nature of Liberia (SCNL)

Birdlife Partner

Tubman Boulevard, Congo Town, CARE Compound

P.O. Box 2628 Monrovia, Liberia, West Africa

(+231) 886-573-612/0777544611

Website: www.scnlliberia.org

E-mail: scnlliberia@yahoo.com

Michael Garbo
Executive Director
Society for Conservation of Nature of Liberia
Congo Town, Monrovia

March 20, 2020

Dear James Desmond,

This letter is intended to confirm the approximate costs for field sampling per animal. These costs are based on extensive field operations for the USAID funded PREDICT project in which nearly 6000 animals (bats and rodents) were sampled. We estimate that the field costs for consumables is approximately $27.03 per animal sampled.

We are using this rate for the proposed project: *Reducing the threat from high-risk pathogens causing febrile illness in Liberia*. Please feel free to contact me if you have any questions or need additional information.

Sincerely yours,

Mr. Michael F. Garbo
Executive Director/SCNL

Society for the Conservation of Nature of Liberia (SCNL)

Birdlife Partner

Tubman Boulevard, Congo Town, CARE Compound

P.O. Box 2628 Monrovia, Liberia, West Africa

(+231) 886-573-612/0777544611

Website: www.scnlliberia.org

E-mail: scnlliberia@yahoo.com

Michael Garbo
Executive Director
Society for Conservation of Nature of Liberia
Congo Town, Monrovia

March 20, 2020

Dear James Desmond,

Due to difficult road conditions in Liberia and the age of the vehicle, a White Toyota Land Cruiser (2012 – model: HZJ76L-RKMRS; JTEEB71J407015751), our vehicle costs per month over the past 12-months have been approximately $428.00 for a total of $5136 annually. This costs were incurred during extensive field work under the USAID funded PREDICT project. In addition, in order to make this vehicle roadworthy for fieldwork it will require an investment of $670. The annual total for year 1 is $10,942.00 notwithstanding the purchase of a new vehicle, also included in the budget.

Sincerely yours,

Mr. Michael F. Garbo
Executive Director/SCNL

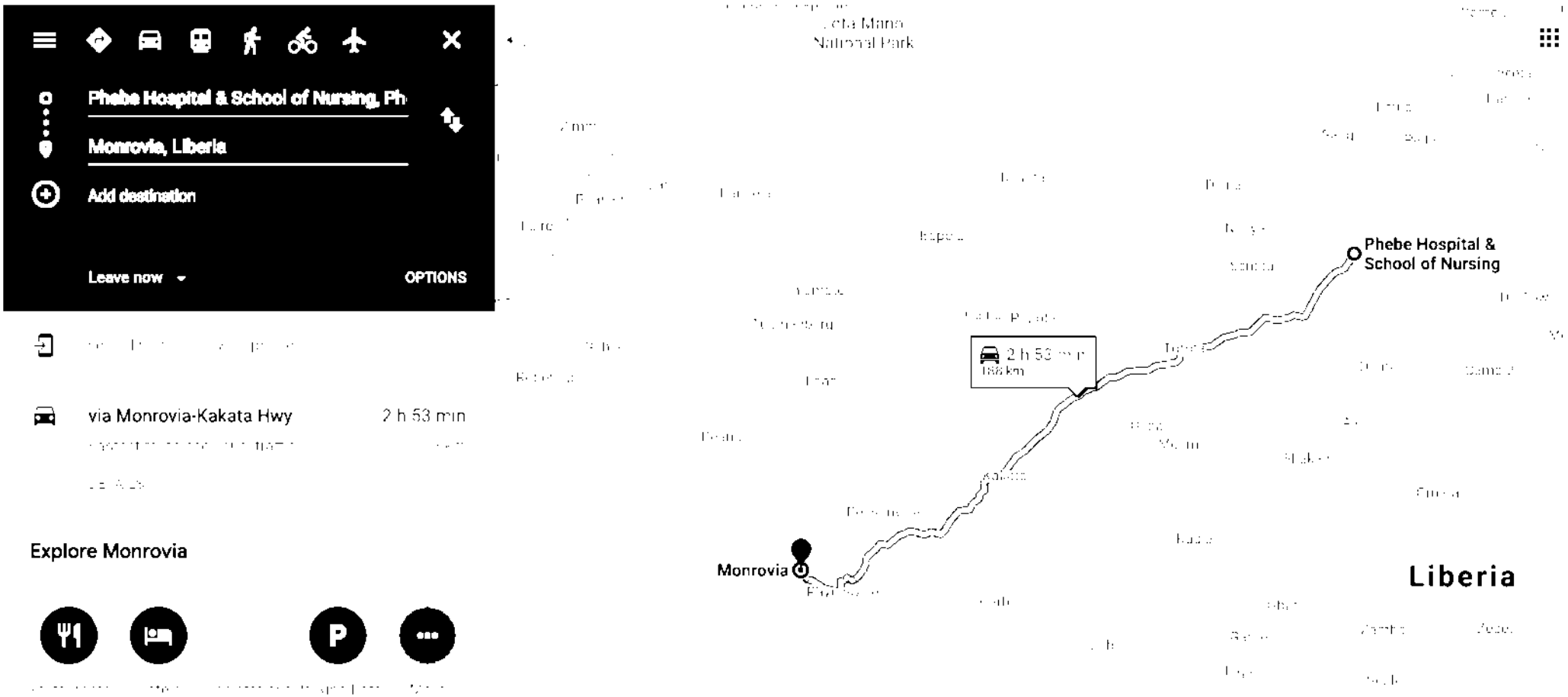
	Type	Vehicle Registration Number	Year	Registered Owner	Model	Make	Model	Manufacturer	Chassis Number	Engine Body	Colour	Engine Number	Supercar Allowance Fee	Fuel	Odometer Reading	Transmission	Status	Purchased Value	Date Purchased	Annual Depreciation Cost (FBT)	Valid Registration To	Valid Registration Expires	Insurance Company	Insurance Policy	Insurance Expiry	Insurance Premium Paid	Insurance Policy Number	Insurance Claim Total	Insurance Claim Paid	Insurance Policy Status	Total Service Cost Incurred (Lease)	Cost of Repairs and Consumables per Vehicle	Total Vehicle Service Cost

General Service @ every 5 000KM (Frequency of Service)

Description	Qty	Unit Price	Line Total
Engine Oil	10 Litre	$ 450	$ 4 500
Oil Filter	1 PCS	$ 200	$ 200
Fuel Filter	1 PCS	$ 250	$ 250
Air Filter	1 PCS	$ 200	$ 200
Front Brake Pad	1 SET	$ 750	$ 750
Rear Brake Shoes	1 SET	$ 700	$ 750
Front Shock Absorber Bushings	4 PCS	$ 450	$ 1 800
Rear Shock Absorber Bushings	4 PCS	$ 450	$ 1 800
Front Stabilizer Bushing	2 PCS	$ 450	$ 900
Rear Stabilizer Bushing	2 PCS	$ 450	$ 900
Labour Charges	1 Unit	$ 5 000	$ 5 000
		TOTAL	$ 17 850.00

Repairs between 10 001km to 50 000km

Front Shock Absorber	2 PCS	$ 1 500	$ 3 000
Front Shock Absorber	4 PCS	$ 1 500	$ 6 000
Rear Shock Absorber	4 PCS	$ 1 500	$ 6 000
Rear Shock Absorber	4 PCS	$ 1 500	$ 6 000
Front Brake Pad	1 SET	$ 1 500	$ 1 500
Alternator Belt	1 SET	$ 1 500	$ 1 500
A/C Belt	1 PCS	$ 2 000	$ 2 000
Labour Charges (Engine Removal)			$ 7 500
		TOTAL	$ 35 500.00


Phebe Hospital & School of Nursing, Ph
Monrovia, Liberia
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2 h 53 min
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Phebe Hospital &
School of Nursing
2 h 53 min
188 km
Monrovia
Liberia

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OPTIONS

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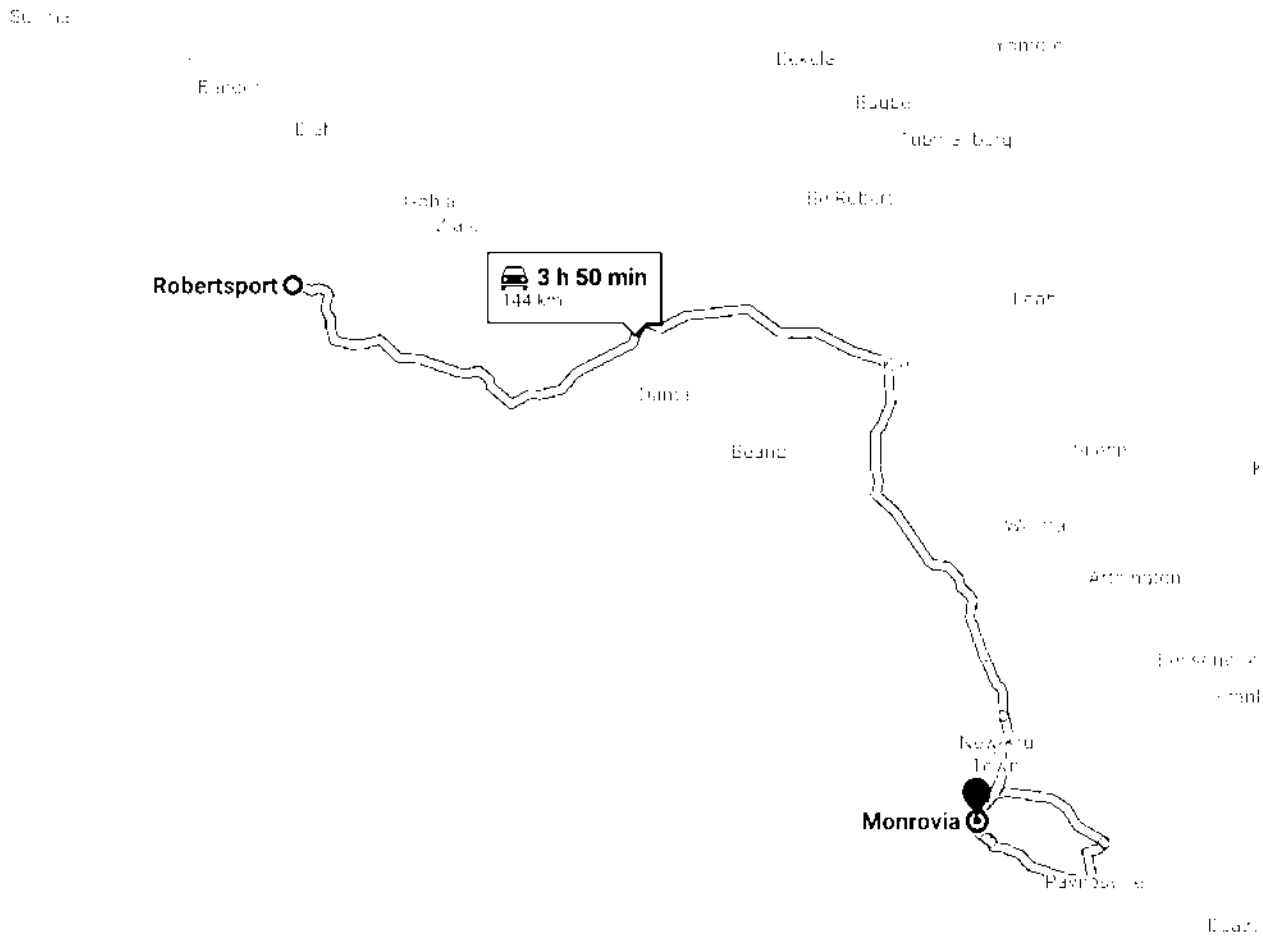
Explore Monrovia



Tablets and case: $228.98 each

Your order qualifies for FREE Shipping.
Choose this option at checkout. See details

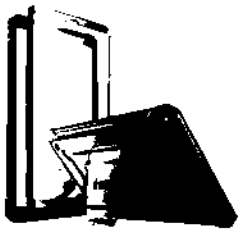
Subtotal (13 items): $1,225.87

This order contains a gift

Proceed to checkout

Shopping Cart

Price



SupCase Unicorn Beetle Pro Series Designed for Galaxy Tab A 10.1 (2019 Release), Full-Body Rugged Heavy Duty Protective Case with Built-in Screen Protector for Galaxy Tab A 10.1 Inch 2019 (Black) $26.99

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Note we will order 8, only 5 were allowed to be ordered at a time. This adds another $605.97 to the total

Subtotal (13 items): $1,225.87
Updated Subtotal (16 items): $1,831.84

The price and availability of items at Amazon.com are subject to change. The Cart is a temporary place to store a list of your items and reflects each item's most recent price. Learn more
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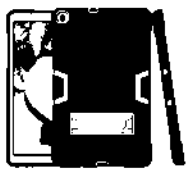

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Fisherbrand™ Portible Centrifuge Kit

Fisherbrand Portible Centrifuge Kit offers a convenient way to spin down and prepare samples outside of a convential laboratory environment

Catalog No. 14-127-556

$442.00 / Each

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Includes:

- Fisherbrand Standard Centrifuge
- 6 Place 1.5/2.0mL tube rotor
- 16 Place 0.2mL tube rotor (singles or 2 x 8 strip)
- 6 tube adaptors (0.2mL)
- 6 tube adaptors (0.5mL)
- 4 Replacement O-Rings
- Storage case for rotors and adapters
- 16 place tube rack
- Low voltage, double insulated power adapter with 4 interchangable plugs
- Fisherbrand Transport Box
- 16 place tube rack insert
- Transport Box dividers
- Centrifuge cradle
- 12V Car Adapter

Description

Features:

- Enables the processing of samples before deterioration can take place
- Can be used in remote enviorments where a normal electrical supply is not an option
- Kit enables immediate on-site testing for faster results
- Kit includes its own 12V car adapter and a 12V DC power adapter
- Carry the centrifuge and its components securely in the Fisherbrand Transport Box
- Fisherbrand transport box is transparent so samples contained can be viewed and their integrity checked

Compliance

Meets all global certifications. Suitable for worldwide voltages 100 to 240 VAC 50/60 Hz

Warranty and Services

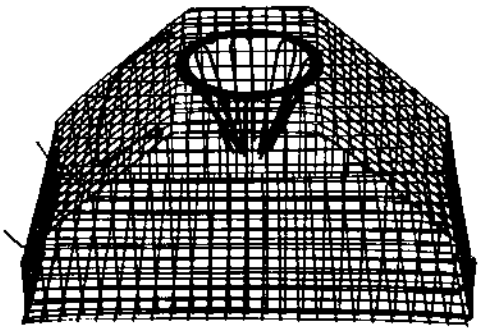
2-Year warranty

Specifications

Capacity	6 x 1.5/2mL tubes (rotor 1: adapters for 0.5mL and 0.2mL tubes)	Max. Speed	6000rpm
		Hertz	50 to 60Hz
Max. RCF	2999 x G	Type	Mini-centrifuge kit
Voltage	100/240V	Electrical Requirements	Universal plug; Car adapter
Includes	Mini Centrifuge, 12V car adapter, 12V DC power adapter, transport box, 16-place micro tube rack	Refrigerated	No
For Use With (Equipment)	Mini centrifuge		
Product Line	Centrifuges and Microcentrifuges		

Grip Catch and Release Rodent Trap — 12 1/2in. x 8in. x 6 1/2in., Model# 54257

Item# 68611 New — Write a Review



Reg. $14.99

Sale $11.99 *Order today to guarantee this price*

Save $3.00

Ship It
Backordered Online — will ship in 30 or more Business Days

- Multi-catch technology allows you to catch multiple pests at one time without the need to reset the trap again and again
- Size of the opening can be adjusted to accommodate the size of the rodent being trapped
- Simple hinged bottom makes for easy removal and reuse
- Steel construction resists rust and corrosion
- Easy-to-use design

Product Summary

This non-mechanical Grip Catch and Release Rodent Trap with multi-catch technology is the ideal and humane way to trap and relocate larger rodents, rats, squirrels, chipmunks and other similarly-sized gnawing rodents and animal pests. Fully assembled and ready to use. 12 1/2in.L x 8in.W x 6in.H.

What's Included
(1) Live catch mouse trap

Features + Benefits

- Multi-catch technology allows you to catch multiple pests at one time without the need to reset the trap again and again
- Size of the opening can be adjusted to accommodate the size of the rodent being trapped
- Simple hinged bottom makes for easy removal and reuse
- Steel construction resists rust and corrosion
- Easy-to-use design

Key Specs

Item#	68611	**Includes**	1 trap
Brand	Grip	**Assembly Required**	No
Manufacturer's Warranty	3 month parts/no labor	**Dimensions L x W x H (in.)**	12 1/2 x 8 x 6 1/2
Ship Weight	2.0 lbs	**Product Weight (lbs.)**	2
Indoor/Outdoor Use	Indoor/outdoor		
Material Type	Steel		

Compare with Most Popular Rodent Control

	Item# 168919	Item# 375360	Item# 168433	Item# 68611 (Currently Viewing)	Item# 68670
					
	Victor Sonic Pest Chaser Rodent Repeller — Model# M792	Around the Home Metal Mole Trap, Model# EMT	Sonic Molechaser Pest Repeller — Aluminum, Covers 11,250 Sq. Ft., Model# 7900	Grip Catch and Release Rodent Trap — 12 1/2in. x 8in. x 6 1/2in., Model# 54257	Bird-X Pest-X Electronic Pest Chaser — Model# PX-110
	(17)	(24)	(73)	(Not Yet Rated)	(Not Yet Rated)
	Reg. $44.99 **Sale $39.99** Save $5.00	Reg. $29.99 **Sale $24.99** Save $5.00	Reg. $19.99 **Sale $17.99** Save $2.00	Reg. $14.99 **Sale $11.99** Save $3.00	Reg. $9.99 **Sale $2.50** Save $7.49
Indoor/Outdoor Use	Indoor	Outdoor	Outdoor	Indoor/outdoor	Indoor
Coverage	-	-	11,250 sq. ft.	-	500 sq. ft.
Material Type	Plastic	Steel	Aluminum	Steel	Plastic
Includes	110 dB signal	-	Irritating sonic pulse	1 trap	One plug-in repeller
Power Source	Electric	-	Battery	-	110V AC
Assembly Required	No	No	No	No	No
Dimensions L x W x H (in.)	3 1/2 x 5 1/2 x 3 1/2	6 x 6 x 12	-	12 1/2 x 8 x 6 1/2	3 x 2.5 x 1.5
Product Weight (lbs.)	-	-	-	2	-

Uline WOVEN POLY TARP 40X60IN

Manufacturer: Uline S8401

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Catalog No. NC1754350

$109.47 / Each

Qty Check

Availability

Cover Sheet

Proposal Number	FRBAA14-6-2-0436
Phase I Proposal Number	FRBAA14-6-1-0945
Topic	Thrust Area 6
Proposal Title	Reducing the threat from high-risk pathogens causing febrile illness in Liberia

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 W 34th St 17th Floor
Tax ID	311726494	**City**	New York
DUNS	0770900660000	**State/Province**	NY
CAGE		**Zip**	10001 - 2320
Website		**Country**	USA
POC Name	Dr. Ellen Carlin	**POC Email**	carlin@ecohealthalliance.org

Cost

Applicant Certification

Organization Type	Non-Profit Organization
Are Human Subjects involved?	**No**
Are Vertebrate Animals involved?	**No**
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	**No**

Agency 1	**Contract/Grant No.**
Agency 2	**Contract/Grant No.**
Agency 3	**Contract/Grant No.**

Are you a current DoD Contractor or Grantee?	**No**
Agency	**Point Of Contact**
Phone #	

Principal Investigator 1

Business Official 1

Prefix	Dr.	**Prefix**	Dr.
Name	William Karesh	**Name**	Aleksei Chmura
Title	Executive Vice President of Health and Policy	**Title**	Authorized Organizational Representative
Address 1	460 W 34th St	**Address 1**	460 W 34th St
Address 2	17th Floor	**Address 2**	17th Floor
City	New York	**City**	New York
State	NY	**State**	NY
Country	USA	**Country**	USA
Zip	10001 - 2320	**Zip**	10001 - 2320
Phone	212-380-4463 Ext :	**Phone**	212-380-4473 Ext :
Fax	212-380-4465	**Fax**	212-380-4465
Email	karesh@ecohealthalliance.org	**Email**	chmura@ecohealthalliance.org

Proprietary Information (list page numbers)

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project.

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

Project summary/abstract This publicly releasable abstract is provided to DTRA for use in fulfillment of Section 8123 of the Defense Appropriations Act and future versions of the same. This project is designed to help identify the causes of infectious acute febrile illness (AFI) in Liberia, particularly among patients with a history of animal contact. AFI is a group of illnesses characterized by the rapid onset of fever and may include related symptoms like headache, chills, joint pain. Many of the pathogens that cause AFI are difficult to diagnose. This is especially true in countries where a malaria diagnosis is often presumed and no further testing is performed, a situation that creates vulnerability to unexpected outbreaks. In Liberia, one of the countries directly impacted during the 2014-2016 West Africa Ebola outbreak, the pathogens and risk factors that result in a burden of febrile illness in the population have not been systematically identified. This project's goal is to build capacity in Liberia for threat reduction through an integrated human-animal surveillance approach to high consequence zoonotic pathogens associated with human AFI. We will do this by testing samples from patients presenting at hospitals with febrile illness for high-risk pathogens, while also assessing the animals with which these patients interact. At the National Public Health Institute of Liberia, we will use molecular methods including real-time PCR, next generation sequencing, and antibody serology to identify viral, bacterial, and protozoal causes of

fever. Laboratory results will be compared to the presumptive clinical diagnoses. We will interview patients to characterize their animal exposure and will sample domestic and peridomestic animals (rodents, bats, livestock, dogs) in the homes and communities of pathogen-positive patients. Results will allow us to develop improved clinical diagnostic protocols, estimate the frequency of human exposure to high consequence pathogens, characterize exposure to potential animal reservoirs and carriers, and implement risk reduction strategies. This project will support the goals of Liberia's One Health Coordination Platform and provide a basis for future detection, surveillance, and threat reduction activities. The work will build on U.S. investments that have begun to reveal circulating animal pathogens of highconsequence concern, utilize the substantial laboratory infrastructure built in Liberia in the last four years, and sustain personnel capacities that have been developed to support it.

I. ABSTRACT: To test the hypothesis that a proportion of acute febrile illness in Liberia is misdiagnosed and potentially the result of emergent zoonotic pathogens of public health and proliferation risks, we will build local capacity using One Health approach to assess circulating pathogens and improve clinical and biosurveillance protocols for biological threat reduction. With the National Public Health Institute of Liberia (NPHIL), we will enroll patients presenting with acute fever at major hospitals in Monrovia and Bong County. Patient samples will be screened at the point of care per normal clinical protocols and tested at NPHIL for high-consequence viral, bacterial, and protozoal causes of fever via multiplexed specific real-time PCR, next generation sequencing, and convalescent serology. Laboratory results will be compared to the presumptive clinical diagnoses and both datasets will be compared to county surveillance records. We will interview patients to characterize their animal exposure and, with a local non-governmental organization and the Ministry of Agriculture, will sample domestic and peridomestic animals (rodents, bats, livestock, dogs) in the homes and communities of pathogen-positive patients to identify evidence of those pathogens in animals. Results will allow us to develop improved clinical diagnostic protocols, estimate the frequency of human exposure to high consequence pathogens, characterize exposure to potential animal reservoirs and carriers, and implement risk reduction strategies. This project will support the goals of Liberia's One Health Coordination Platform and provide a basis for future detection, surveillance, and threat reduction activities.

II. SCOPE

A. Objective: This project's goal is to build Liberian capacity for threat reduction through an integrated human-animal surveillance approach to high consequence zoonotic pathogens associated with human acute febrile illness (AFI). AFI is a group of illnesses caused by a variety of pathogens difficult to differentiate clinically due to similarities in presentation.[1] While there is no universal definition, AFI is often considered as rapid onset (i.e., acute) fever with or without related symptoms (headache, chills, joint pain). Many AFI causative agents may go undetected empirically by common rapid diagnostic tests or by existing surveillance platforms. We will work to mitigate this challenge through scientific discovery, hypothesis testing, and capacity building while leveraging significant U.S. government and other investment in workforce building and laboratory infrastructure. As many emerging diseases have been inadequately studied in Liberia,[2] this project will provide fundamental baseline knowledge of pathogens circulating and potentially causing human illness. Its outcomes will suggest opportunities for improved clinical training, tailored case definitions, and other methods to improve identification rates for especially dangerous pathogens at the index case level and prior to widespread transmission.[3] The desired endpoint is a broad, sustainable surveillance program that enhances public and global health security. We outline three objectives toward the project goal and three hypotheses to test in support of their achievement:

Hypothesis 1: Emergent and/or high-risk pathogens cause an undiagnosed subset of acute febrile illness in humans in Liberia → **Objective 1**: Identify causative agents of AFI in Liberia
Hypothesis 2 (a sub-hypothesis of H1): A subset of AFI cases are due to high-consequence zoonoses, even among patients who test positive for endemic pathogens → **Objective 2**: Identify evidence for zoonotic transmission of high-consequence AFI pathogens
Hypothesis 3: Exposure to domestic animals and wildlife increases the likelihood that AFI cases result from zoonotic animal to human transmission → **Objective 3**: Identify risk factors for zoonotic AFI in humans

B1. Background: Limited detection and diagnostic capacity reduces the ability of clinicians and public health professionals to accurately identify infectious agents. Febrile illness presents an unquantified and undifferentiated burden to Liberian health and the health care system and continues to do so. Liberia's public health authorities do not assess incidence of febrile illness. Some studies are just beginning to assess this. Other published studies have reported on causative agents of infectious fever in other low- and middle-income countries (LMIC), including in West Africa.[2,4-6] In low resource settings where malaria is endemic, patients presenting with febrile illness may be treated presumptively for malaria[7] and not receive an accurate diagnosis for reasons such as poor differential protocols or lack of available diagnostics.[8-11] Co-infections may also be common, particularly with malaria parasites; for example, 19% of Ebola PCR-positive samples from an Ebola Treatment Unit in Liberia were also positive for *Plasmodium* spp.[12] Malaria was the clinical diagnosis for >60% of fever cases in a recent study in Tanzania, but the actual cause of fever in only 1.6%.[13] Where studies have sought to investigate the source of febrile illness, high-risk pathogens of proliferation concern such as *Brucella*, dengue virus, and viral hemorrhagic fevers have been observed.[2,4,14] In Sierra Leone, over 25% of patients negative for Lassa virus showed serological evidence of infection with other arthropod-borne hemorrhagic fever viruses.[6] **The specific challenge** for Liberian health authorities is that pathogens that result in a burden of febrile illness in the population—and the zoonotic transmission pathways that may drive it—have not been systematically nor comprehensively identified.

B2. Research Justification: Inaccurate identification of pathogens may result in untreated illness, further transmission, and development of antimicrobial resistance.[15,16] It can increase the risk of accidental acquisition of dangerous pathogens from the environment or diagnostic specimens. Improper diagnosis can also skew health care providers' perceptions of disease prevalence among health care providers.[3] Diagnosis limited to a single disease (malaria, typhoid) ignores the risks of co-infection. Further, a poor understanding of the diversity of zoonotic viruses in animal reservoirs creates an impediment to preventing outbreaks of novel zoonotic viruses; developing an *a priori* understanding of these pathogens' molecular characteristics may help reduce the time to identification of the animal reservoir and mechanism of spillover in an outbreak.[17] Because many emerging diseases have been inadequately studied in Liberia, this project will provide new knowledge of pathogens circulating in people and animals and potentially causing human illness there. This baseline will enable more informed biosurveillance and decision-making, and the process to develop this knowledge offers significant opportunity for building Liberia's capacity to rapidly and accurately detect and diagnose biological threats. The study will promulgate new findings about especially dangerous and other high-consequence agents (U.S. "Select Agents" and other emerging infections with pandemic potential) circulating in Liberia that may result in pandemics or be appropriated for misuse, and for which risk assessments and mitigation measures are yet to be developed. Hypothesis testing will leverage preliminary data we have collected through USAID's PREDICT project about the general Liberian population, which suggest that the split among those who do and do not have live animal contact is up to 60%/40%, enabling a control group and thus a strong statistical basis from which to test hypothesis 3. While causation cannot be definitively confirmed in any case in which we find a zoonotic pathogen, by uncovering individuals' exposures to animals that are known hosts to those pathogens, and by identifying the same pathogen (and genetic relatedness) or antibodies in such animals, we can develop an evidence base tied to transmission risk. The use of human subjects is necessary to enable testing the hypotheses at the core of this proposal about human febrile illness their interactions with livestock and wildlife. Human sample testing will be for research purposes only, not diagnosis; the multiplex

screening assays we will employ are not approved for clinical use and the tests in most cases will not be run immediately. An Institutional Review Board application is pending. Sampling of animals (non-lethally) is necessary to assess the presence and prevalence of circulating high-consequence pathogens and antibodies in animal populations, and to test the hypothesis that human interaction with these animals may increase transmission risk. An Institutional Animal Care and Use Committee application is pending. Bats and rodents are prioritized because they are key wildlife reservoirs for zoonotic viruses;[18] livestock and dogs can also harbor zoonotic agents and are likely to have relatively significant direct and indirect interfaces with humans.

B3. Expected Outcomes and Scientific Impact for C-WMD Science: This project will help further identify and characterize the etiological agents of infectious AFI in Liberia, particularly among patients with a history of animal contact. It will build on U.S. investments that have begun to reveal circulating animal pathogens of high-consequence concern and will utilize the laboratory infrastructure built in Liberia in the last four years and support personnel that have been trained to support it. It will also support Liberia's One Health Coordination Platform (OHCP) by using an integrated human-animal approach to surveillance and detection of high consequence zoonotic pathogens, and by ensuring that relevant sectors including those representing the environment (through the national Forestry Development Authority and through EHA's sustainable forestry research initiative) are included in data sharing and are represented at project workshops. The combined approach of PCR (singleplex and multiplex), next-generation sequencing (NGS), and antibody serology will maximize detection capability more than any single test alone,[17] and enable the design of more routine single- or multi-plex qPCR testing flows based on the most common pathogens for the national labs to use when receiving AFI samples. Serology will be especially relevant for animal sampling because antigen positive sample rates may be low (PREDICT bat sampling, for instance, provided ~ 4% positive viral infection rate on PCR; unpublished data). The project will also produce a unique incidence profile of high-consequence viral and bacterial agents in the human febrile population and their relatedness to pathogens circulating in animal species with close human contact, and differentiate the illness they cause from routine or endemic pathogens including protozoal species. Establishing a pathogen baseline or a microbiodiversity inventory is critical for: 1) enabling rapid identification of agents of high-consequence concern to the national and international communities; 2) creating a comparator for future surveillance data and intervention activities; and 3) building capacity for sampling and diagnostics to enable targeted and syndromic surveillance. Accurate and timely detection of rare and high-risk pathogens based on clinical assessment of febrile patients combined with appropriate and accurate laboratory testing can greatly facilitate implementation of appropriate control measures, reducing population morbidity and mortality, and minimizing potential biological threats.[10,19,20] Building on existing DTRA investments, this project will help ensure continuity of past and ongoing training and capacity building efforts. By collating results from a similar project in development for Guinea and coordinating with other febrile illness studies in-country, this work will help produce a regional picture of febrile zoonotic disease risk in West Africa that can inform U.S. personnel decisions in the region, surveillance efforts, and medical countermeasure investment priorities.

B4. Potential Challenges and Proposed Solutions: Collaborative research projects assume a degree of risk (communication difficulties, pressures on sustainability of each partner's commitment). We have selected core collaborators based on their excellent scientific reputation and existing relationships with EcoHealth Alliance (EHA). The Liberian ministries and scientists implementing this project are heavily invested in the success of their surveillance and detection capacity building, demonstrated through their successful PREDICT partnerships and collaboration

with DTRA to construct a new reference laboratory; all U.S. partners have demonstrated a sustained commitment to and successful track record in West Africa and to strengthening surveillance and detection. To overcome laboratory diagnostic challenges, we will employ a multi-platform laboratory approach to achieve the greatest sensitivity and specificity possible and the addition of NGS will improve power to detect positive samples. Socially, we do not believe that mistrust of government/health workers post-Ebola crisis presents a risk: our patient population will have already sought health care, and we will be using local hires to implement the study; EHA also has a track record of successful enrollment of human subjects in Liberia for PREDICT over the last three years. EHA will provide financial oversight over all project partners' budgets and expenditures. Liberia does not have a VAT and our conversations with Liberian partners indicate it is unlikely they will instate one in the near future.

C. Programmatics

1. Study site: Liberia has been working to mitigate challenges in infectious disease diagnosis, surveillance, and case reporting to the national level.[21,22] In accordance with Integrated Disease Surveillance and Response (IDSR) system guidelines, national protocols require diagnostic confirmation for many of the known causes of febrile illness,[23] but in many cases no further testing is performed. We choose to work in Liberia because: 1) recent federally-funded evaluations have begun to document a presence of high-consequence and potentially high-consequence zoonotic pathogens circulating in animal populations there, including Zaire ebolavirus;[24] 2) the presence of and risk factors for emerging infections are still relatively understudied; and 3) historically weak laboratory infrastructure has recently benefitted from construction and capacity building since the Ebola outbreak, and now requires further training and sustainment. At the county level, Montserrado is chosen due to the greatest potential for a large sample size from one of its major public, high-volume hospitals with 200 beds, Redemption Hospital on the outskirts of Monrovia. Bong County is a rural comparator with Phebe Hospital, a private hospital that receives public money and affords a reasonably well-equipped facility with good patient volume. Further, Bong County borders the Forest Region of Guinea, where inaccessibility inhibits research on the Guinea side of the border. Both counties also demonstrate relatively detailed weekly reporting to their health ministries, thereby providing a sizable basis for comparison to weekly epidemiological data.

2. Performers: EHA will lead on study design/methodological development, animal sampling field implementation (co-lead), and analysis and results development/dissemination. All other major activities will be led by country partners, including government agencies and NGOs. Our collaborative team incorporates the human, animal, and environmental sectors, critical to supporting a One Health approach and meeting project objectives to identify and mitigate zoonotic diseases. Team members have a long history of successful collaborations on research and capacity building initiatives (number of years of collaboration with EHA listed in first column):

Institution	**Study design**	**Human patient recruit-ment**	**Human sampling, transport & training**	**Animal sampling transport & training**	**Sample testing & lab training**	**Analysis & dissemin-ation**
EHA	✓(Lead)			✓(Co-Lead)		✓(Lead)
Overall project oversight; day-to-day project development and strategic management, including weekly phone calls with partners;				*William B. Karesh*, DVM (PI) *Ellen P. Carlin*, DVM (Co-I) *Jonathan Epstein*, DVM, MPH, PhD (Co-I)		

study design development and refinement; field sampling; human subjects research training; data analysis; risk reduction workshop lead; and information dissemination through workshops, conferences, and papers; Tasks 1-7				*Anne Laudisoit*, PhD, Senior Ecologist *Emily Hagan*, MPH, Behavioral Risk Scientist *Catherine Machalaba*, MPH, Policy Advisor *Noam Ross*, PhD, Senior Scientist, Modeler		
NPHIL (4)	✓	✓(Lead)	✓(Lead)		✓(Co-Lead)	✓
Overall project oversight for Liberia-based activities; study design; lab oversight and personnel decisions; direct laboratory supervision; personnel decisions; assisting with laboratory training, staffing, & testing; liaison with MOH on human sampling; liaison with MOA for vet personnel; data analysis & dissemination; Tasks 1-3, 6, 7				*Mosoka Fallah*, PhD, MPH, MA (Co-I) *Fatorma Bolay*, PhD, MS, Laboratory Scientist *John Dogba*, MPH, Laboratory Scientist *Bode Shobayo*, MSc, Laboratory Scientist		
LCRP (10)	✓		✓	✓(Co-Lead)		✓
EHA in-country project liaison; working with all ministries and NGOs to ensure intra-project communication; oversight over animal sampling; study design, data analysis & dissemination; Tasks 1, 4-7				*James Desmond*, MS, DVM, Field Veterinarian		
SCNL (4)	✓		✓	✓(Lead)	✓(Lead)	✓
Lead on animal field sampling implementation and oversight; study design; data analysis & dissemination; Tasks 1, 2, 4-7				*Michael Garbo,* MS, Environmental Scientist		
UNMC (0.4)	✓			✓	✓	✓
Oversight of laboratory work including training inventory, and quality control; study design; data analysis & dissemination; Tasks 1, 3, 6, 7				*Michael Wiley*, PhD, Molecular Biologist		
GU (4)	✓					✓
Study design; refinements to study implementation based on data generated; analysis of data from Liberia and sharing of data generated in Guinea, where they are developing a parallel project; data dissemination; planning and implementation support for technical meetings; Tasks 1, 6, 7				*Claire Standley*, PhD, MSc, Senior Scientist *Erin Sorrell*, PhD, Senior Scientist		

EHA: EcoHealth Alliance; MOH: Liberia Ministry of Health; NPHIL: National Public Health Institute of Liberia; SCNL: Society for the Conservation of Nature of Liberia; LCRP: Liberia Chimpanzee Rescue and Protection; UNMC: University of Nebraska Medical Center; GU: Georgetown University Center for Global Health Science and Security.

D. Relevance

In Liberia, individuals suffering from fever who report to health care providers may be treated symptomatically or empirically for presumptive endemic diseases like malaria or typhoid. Positive results from rapid diagnostics (e.g., for malaria and typhoid), which are becoming increasingly available at the point of care even in remote areas, do not rule out other underlying febrile agents for which advanced testing is not the norm; in general, samples to test for Ebola are sent to the

national reference laboratory only when a clinician has a particular index of suspicion. The scientific community's fundamental understanding of infectious febrile illness in Liberia is thus based largely on conjecture. This project will advance the state of emerging infectious disease science by generating knowledge about a range of circulating pathogens in people and animals in Liberia, including presence, speciation, incidence, and estimated prevalence. This foundation will allow research and public health communities to measure change against this baseline—both naturally occurring changes, and reductions in incidence following effective interventions. It will also help establish baselines for incidence which can then inform procedures such as outbreak investigations or activation of the national emergency operations center. The project will also advance Liberia's capacity for research and biosurveillance. Improving ability to rapidly detect and report new incidence will improve the country's readiness for outbreaks whether natural or intentional. Informing interventions such as modified clinical intake, differential algorithms, and diagnostic protocols will minimize vulnerability to outbreaks. Little is known about viral dynamics of wildlife as they relate to spillover risk, creating a significant impediment to preventing human outbreaks of novel zoonotic viruses.[17] This study will help generate an evidence base and strengthen Liberia's experience in leading interdisciplinary research and surveillance efforts. The project will engage students from the University of Liberia and Cuttington University. Project staff will be fully trained in human subjects research, sample transport, biosafety and biosecurity, diagnostic testing, animal sampling, data analysis, risk reduction, and reporting. We will ensure that all surveillance data and other results are shared among the Liberian ministries of health, agriculture, and forestry, and we will assist them in their reporting to the World Health Organization (WHO) and the World Animal Health Organisation (OIE), thus advancing Liberia's commitment to meeting international obligations.

III. CREDENTIALS

Principal Investigator: Dr. William Karesh is the Executive Vice President for Health and Policy for EHA. He serves as the President of the OIE Working Group on Wildlife Diseases. Dr. Karesh was the Technical Director of the $75M USAID Emerging Pandemic Threats PREDICT project, Dr. Karesh designed, organized, and managed the implementation of zoonotic disease research in 28 countries and served as the liaison to coordinate with government, university, and NGO partners in the $140M second phase of the project resulting in the collection of over 350,000 specimens from humans, livestock, and wildlife yielding gene sequencing suggesting the identification of over 900 novel viruses, including a new filovirus and the first finding of Ebola Zaire in a bat in West Africa. He has created, directed, and/or managed projects and programs in more than 60 countries, including efforts to minimize the impact of diseases such as Ebola, influenza, and anthrax and to develop global surveillance systems for emerging diseases.

Prime Organization: EcoHealth Alliance is a leading research organization established more than 40 years ago that works with local partners in more than 30 countries at the nexus of health, biodiversity, conservation, and international development. EHA has extensive field experience in West Africa and expertise in pandemic prevention and the interconnectedness among zoonotic pathogens, humans, animals, and the environment. EHA has worked in Liberia since 2015 as the country lead for USAID's PREDICT project and since 2019 undertaking a privately funded forest sustainability and health initiative. Working with Liberian partners including NPHIL and SCNL, EHA recently detected Zaire ebolavirus for the first time in a bat in West Africa via the sampling methods that will be used in the present study. For the PREDICT project, our team in Liberia enrolled 585 people and sampled 5387 wild and domestic animals. EHA has a staff of

approximately 50 based primarily in New York City, including scientists (e.g., social scientists, veterinarians, ecologists, analysts, IT experts, economists, epidemiologists), administration, and communications staff. EHA has an extensive record of publishing high quality, peer-reviewed papers, journals, briefing documents, and reports. EHA's demonstrated multi-disciplinary expertise in producing highly utilized and understandable science-based outputs will contribute significantly to achieving project goals and provide objective methods for tracking project utilization of project findings.

Partners: The National Public Health Institute of Liberia (NPHIL) is responsible for infectious disease surveillance, detection, and reporting in Liberia. NPHIL is charged with public health and biomedical research functions and as such will lead the project with government partners through a memorandum of understanding (MOU). DTRA is working with NPHIL to build a biosafety level 3 laboratory that will replace its current research laboratory (Liberia Institute of Biomedical Research, LIBR); LIBR is already equipped with singleplex and multiplex real-time PCR and ELISA serology capability and is capable of safely and securely running a variety of assays; a related laboratory capacity building project is under consideration and if funded will work within LIBR emphasizing NGS. NPHIL will work via an MOU with the *Ministry of Health (MOH)* to implement the human clinical element of the present study by providing personnel to execute the study protocol at county hospitals. NPHIL will also support the training of scientists and technicians from the *Ministry of Agriculture's (MOA) Central Veterinary Laboratory (CVL)*. The scientists will train at NPHIL in the same techniques as the NPHIL scientists. Training a CVL technician and local students in field and laboratory work is a priority for this project and will support Liberia's own OHCP priorities. The scientists will ultimately bring the skills back to their own laboratory, which is equipped with modern equipment, test kits for priority zoonotic diseases, reagents, and consumables that can be used for PCR, ELISA, and bacteriological techniques. Liberia Chimpanzee Rescue and Protection (LCRP) is a Liberia-based non-governmental organization supporting chimpanzee conservation. LCRP works closely with Liberian ministries, including NPHIL and the Forestry Development Authority, on regulatory and policy matters; and advances research on chimpanzee health by working to mitigate infectious disease introduction, including high-consequence infections such as influenza and monkeypox. Its director has been an EHA employee or consultant for 10 years. Society for the Conservation of Nature of Liberia (SCNL) is a non-profit organization that promotes nature conservation, supports the establishment of a protected area network, encourages good governance of natural resource management, and increases public participation in biodiversity conservation. SCNL has implemented animal sampling requirements for the Ebola Host Project (part of PREDICT) through its field teams, who are highly trained in animal sampling, especially bat sampling. Given its experience with cold storage transport, SCNL will also transport the human samples. The University of Nebraska Medical Center (UNMC) is one of four campuses of the University of Nebraska, and one of the major research centers in the state with excellent laboratory and infectious disease credentials. UNMC is developing a separate laboratory capacity-building proposal with NPHIL at LIBR that, if funded, would create efficiencies with training and sample processing for this project. UNMC will leverage as appropriate ongoing work of the U.S. Naval Medical Research Unit-No. 3 (NAMRU-3) in the country in support of the project's laboratory testing objectives. The Georgetown University Center for Global Health Science and Security (GU) is a leading academic institution working on applied public health and policy objectives globally. Its scientists have backgrounds in threat reduction approaches, laboratory bench science, and biosurveillance

reporting structures. The team worked on a 5-year cooperative agreement to improve capacity in neighboring Guinea in emergency management, laboratory capacity, and One Health coordination.

IV. WORK TO BE PERFORMED

A. General. We will produce a cross-sectional data set that identifies pathogens and their relative abundance circulating in people and animals that are potentially resulting in human cases of acute febrile illness. Our approach will enable us to make preliminary epidemiological connections among species. It will also enable us to characterize zoonotic risk and allows for the potential to design interventions. We will compare our laboratory-confirmed human diagnostic data to hospital diagnoses and disease data as reported to the MOH, and in so doing will assess the level of sensitivity in current diagnoses, and work with local partners to develop improved clinical diagnostic pathways. Through workshops (Attachment 3) and laboratory training, Liberian partners will further strengthen their growing capabilities in diagnostics and surveillance, thereby increasing their opportunities for rapid detection and concomitant consequence mitigation. With two option years, we will create opportunities to expand the study to new sites to the north and northeast with different ecologies and occupational drivers of disease risk (livestock farming, mining), and host a regional technical workshop. Public health surveillance and biomedical research training will be a central component of the study.

Training Workshops	Timeline
Workshop 1a: All participants • Overall research study protocol	At Kickoff
Workshop 2a: Task 2 personnel, students • Overview of human study protocol • IRB/human subjects research protocol • Recruitment, consent, & enrollment • Patient questionnaire and administration • Community safety during sample collection	Mid Y1 End Y3
Workshop 3a: Task 3 personnel, students • Biosafety and biosecurity • Sample storage and disposition	At kickoff Mid Y1 Y3 refresh
Workshop 3b: Task 3 personnel, students • real-time PCR testing and analysis • NGS testing and analysis • Serology testing and analysis	At kickoff Mid Y1 Y3 refresh
Workshop 4a: Task 4 personnel, students • Overall animal study protocol • IACUC/animal subjects research • Personal protective equipment • Transport protocol	At Kickoff Mid Y1 Y3 refresh
Workshop 5a: Task 3 and other interested personnel • Results interpretation • Bioinformatics	Y2
Workshop 6a: All personnel, other invited ministries relevant to risk and impact mgt. • Questionnaire and diagnostic data analysis • Reporting (national and international) • Economic analysis • Risk reduction strategies	OY2

B. Summary of Tasks

Task 1: Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1); **Task 2**: Enroll human patients and undertake sampling (Y1-3 & OY1-2); **Task 3**: Undertake sample processing and testing (Y1-3 & OY1-2); **Task 4**: Undertake preliminary animal sampling (Y1); **Task 5**: Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2); **Task 6**: Analyze data (Y2-3 & OY1-2); **Task 7**: Disseminate information to stakeholders (Y2-3 & OY1-2)

C. Detailed Tasks

Year 1

Task 1: Establish an evidence-based research initiative for assessing and addressing high-consequence pathogens in Liberia

Description and Execution: EHA will oversee refinement and finalization of human and animal study protocols and data collection instruments. This stage incorporates planning and training in the protection of human subjects and animal subjects; training in laboratory biosafety, biosecurity, and safe disposal of samples or sampling materials after laboratory work (which will adhere to guidelines in the BMBL 5th edition, sections III VI[25]); laboratory diagnostic techniques; and any necessary revisions to original sampling and testing approach based on DTRA feedback and discussion at the kick-off meeting. We will refine our human subjects data collection tools, piloting our instruments within our research network to assure validity and reliability of the questionnaires. A database will be created for secure data entry and data storage of human subjects data. MOH will assign personnel to train clinical staff and oversee study in clinics in Monrovia and Bong. NPHIL and CVL will assign personnel to laboratory. EHA and Liberian partners will host kick-off meeting in Monrovia, Liberia to which all partners will be invited. Each study partner will present on its roles and specific desired outcomes to support its agency's priorities. In addition, we will invite other researchers undertaking febrile illness and related research in-country, such as the U.S. Centers for Disease Control and Prevention (AFI study), the Walter Reed Army Institute of Research (Joint West Africa Research Group), and the Henry Jackson Foundation (sepsis study). Human subjects research and lab training workshops will occur during kick-off.

Resources: EHA: Three EHA (3) scientists will oversee all necessary refinements to and finalization of human and animal study protocols; work will be done in collaboration with all study partners for input and review. One (1) scientist to provide human subjects research training and clinical protocol-specific training. NPHIL and SCNL: Will assist EHA with logistics for kick-off meeting (conference location, agenda development, etc.). All partners: at least one (1) scientist per partner (and three (3) from EHA) to attend kick-off meeting. UNMC scientists (2) will host first of three five-day laboratory training workshops (biosafety & biosecurity (1 day), diagnostic techniques (4 days)) concurrent with kick-off.

Metrics of success: Number of partner organizations and number of scientists from each organization who attended kick-off meeting; presentations delivered; partner agreement to finalized protocols; number of personnel assigned to field and lab positions.

Deliverables: Methods and related protocols available for distribution to all partners at or before kick-off meeting and revised as necessary after kick-off; list of Liberian personnel to be assigned to field and laboratory stations; database for secure human subjects data storing and analysis; data collection instruments; completed kick-off meeting.

Subtasks: (Format: Year#.Task#.Subtask#)

1.1.1 Refine and finalize human and animal study protocols and data collection instruments
1.1.2 Secure and finalize all research permits (human and animal) including IRB, IACUC, and national approvals in Liberia
1.1.3 Assign MOH, NPHIL, and CVL staff to field and laboratory positions
1.1.4 Host kick-off meeting in Liberia
1.1.5 Conduct Workshop 1a: overall research protocol (concurrent with Task 1.1.4)

Task 2: Enroll human patients and undertake sampling

Description and Execution: Due to the potentially prolonged timeframe to acquire IRB approval in country, human enrollment is expected toward the end of Year 1. EHA will train study staff in

human subjects research and patient recruitment; biosafety, safe and secure sample collection, handling, packaging, and transport; and implementation of the study protocol. Training will provide the principles for safe and ethical human subjects research; and project-specific teachings to ensure staff understand, practice, and can implement the study protocol (enrollment determination, informed consent, and questionnaire administration (demographic information, animal ownership), sample acquisition, data entry, and sample packaging and readying for transport). MOH will provide a locally hired on-site project coordinator to work with the hospital team and oversee the study protocol (train clinicians and nurses; be alerted when febrile patients arrive; work with hospital staff to oversee informed consent, enrollment, sample collection, and interviews). Hospital personnel from Redemption Hospital and Phebe Hospital will follow their routine intake and diagnostic procedures, then invite voluntary enrollment from adult patients and children older than four years of age (with parental consent) presenting with acute febrile illness (documented fever $\geq$37.5°C at presentation, with or without concomitant reported symptoms within five days of presentation). Fever may be accompanied by other signs but only fever is needed for enrollment. Patients too ill to provide informed consent will be excluded from enrollment. Once enrolled, blood specimens and a nasopharyngeal/oral swab will be collected (for research, not diagnosis), centrifuged (for serum samples), and temporarily stored in a portable ultracold freezer (Stirling, USA) until picked up for transport to LIBR; SCNL will transport research specimens from clinical study sites to LIBR following standard chain of custody protocols (strict cold-chain (liquid nitrogen), biosafety, and biosecurity) (Attachment 3). (Human samples will be collected in duplicate or in a single vial on site and aliquoted in the laboratory.) Clinicians will provide enrolled patient records to the study team to enable review to provide background medical history and other relevant information. Given the high expected number of acutely febrile patients and low expected incidence of high-consequence pathogens, we will recruit continuously, aiming for a total recruitment base of 1,500. For sample collection, clinical research staff will collect specimen concurrently with in-house diagnostic sample collection or shortly thereafter, whichever is least intrusive to patient care. Clinical study sites already employing in-house diagnostics for febrile patients will continue to follow their standard protocols to collect blood and process for ruling out pathogens per their routine protocols via rapid diagnostic and other in-hospital tests (Redemption: malaria rapid diagnostic test (RDT) and microscopy, typhoid RDT; Phebe: malaria and typhoid RDT). For enrolled subjects positive for malaria or typhoid, we will screen their samples to determine whether they are co-infected with other agents that may be contributing to their acute fever.

Study design: Cross-sectional sampling will be used to provide a representative sample of a relatively urban or relatively rural population (depending on site) of individuals with fever. Longitudinal sampling of target populations (not individuals) across up to 2.5 years per clinical study site will maximize the opportunity for detection and possibly reveal seasonal trends in infection or other time-related changes in trends. We will review historical and concurrent surveillance reports for the study counties and for neighboring counties as comparators.

Sample size: Sampling will be based on available volume in the clinical sites but is designed to assure detection of rare pathogens and answering questions about the relative proportion of febrile illness caused by each. We estimate a sample size of 1,500 will enable us to accurately determine the prevalence of causal agents of 95% of AFI cases within 5% of true prevalence with 90% power (based on 1,000 simulated studies). We will also be able to detect rare AFI agents with prevalences as low as 0.2% with 95% power.

Resources: EHA: One (1) scientist to train in human subjects research, including overall study protocol, informed consent, questionnaire administration, data storage, and one (1) scientist to train in sample storage and transport protocol. MOH: One (1) assigned project coordinator for each site; one (1) laboratory technician for sample processing and storage for each site. Two (2) students total from University of Liberia and/or Cuttington University to participate in field work (1 bachelors as a trainee, 1 masters as part of practicum) in biomedicine, public health, nursing, or anthropology. SCNL: One (1) driver to be trained in and to implement sample transport. NPHIL/MOA: Four (4) laboratory scientists (one from each ministry) to participate in training for complete awareness of sample collection, packaging, and transport protocols. Dedicated -80°C freezer.
Metrics of success: Completion dates and number of study staff trained in human subjects research and in specific project protocols; presence of project coordinators at each study site; number of patients enrolled; number of samples sent to LIBR, number of samples tested at LIBR.
Deliverables: Relevant project staff trained in protection of human subjects in research and project protocols; completed on-boarding of project coordinator for each study site; initial enrollment of patients into the study.
Subtasks: (Format: Year#.Task#.Subtask#)
1.2.1 Conduct Workshop 2a: IRB/human subjects research
1.2.2 Locally-hired project coordinator reports to hospital at each study site
1.2.3 Enroll patients (continuous)

Task 3: Undertake sample processing and testing

Description and Execution: NPHIL will receive and process samples at LIBR until the new DTRA-funded national reference laboratory in Monrovia comes online during the study. LIBR reception personnel will be briefed on the study protocol and will notify the project supervisor on receipt of the samples, at which point study-specific inventory and storage procedures will be followed. (One aliquot will be immediately stored while a second is processed for molecular testing.) LIBR has an ABI 7000 Sequence Detection System in operation on which the laboratory scientists and technicians are well trained; a MiSeq system for NGS that is available but requires staff training; and ELISA platforms for serology. NPHIL will budget for and be responsible for ordering needed consumables throughout the project, and UNMC will provide assistance, training, and oversight. LIBR staff are already trained in real-time PCR and ELISA platforms; UNMC will refresh these skills and provide additional training via two one-week didactic and hands-on workshops Y1; another dedicated workshop in Y3; and in other years if needed via visits to the laboratory. These will cover execution of specific pathogen tests, advanced techniques (NGS), and results interpretation (including NGS bioinformatics); sample inventory management; and biorisk management. UNMC will provide oversight and mentorship through their at least twice-yearly working visits to Monrovia and the laboratory as well as video and teleconference. UNMC will leverage its additional DTRA work at LIBR (under funding consideration) to assist with skill-building among laboratory scientists and technicians there. UNMC will assess competence at each visit via a standardized evaluation form to use as a basis for targeted future training.
Laboratory assays: Three types of tests quantitative real-time PCR, NGS, and ELISA will be used together to characterize infection with and exposure to high-consequence zoonotic pathogens in people and animals.[17] To establish a baseline library of viral and bacterial pathogens in common peridomestic wildlife hosts (e.g., bats and rodents), we will test 300 archived oral, fecal, and blood samples collected under the PREDICT Ebola Host Project and stored at LIBR, running them on the MiSeq NGS platform via Ampliseq panels that can be designed to target thousands of

amplicons (Illumina, USA) including specific pathogens and conserved primers. This will allow us to begin training technicians on the technique, which will be used in follow-on project years. Results from this unbiased screening will inform development of the real-time PCR array and provide early insights about potential pathogens and their locations. We are in discussion with NPHIL to determine whether archived human samples from overlapping areas (e.g., Montserrado and Bong) could be used for the same purpose.

For the main study protocol, human samples (which will arrive earliest at end of Y1) will be processed via a modified TAC system (ThermoFisher, USA) for PCR-based detection, a multiple parallel singleplex nucleic acid amplification system that can run on LIBR's existing ABI 7000 PCR machine using a standard 96-well plate.[5,26,27] Its sensitivity (88%), specificity (99%), modest run time (40-90 minutes), and array of available pathogen tests meet the needs of the project.[27] This assay can also be useful in the future for rapid pathogen detection in an outbreak. We will test for the viral, bacterial, and protozoal pathogens listed in the table, for most of which the TAC has already been validated and cycling optimization parameters are published.[5] The pathogens in the table are select agents, Liberian zoonotic disease priorities, and/or plausible febrile etiologies that will help us rule out most of the common etiologies while looking to identify rarer cases of emerging pathogens. Most can be detected in blood (simplifying sampling) except for influenzas and coronaviruses, which will require a nasopharyngeal swab tested by singleplex real-time PCR.

Samples positive by TAC array will be confirmed using specific real-time PCR assays, using published protocols. We will also apply NGS via AmpliSeq to viral positives (estimated ≤10%) to further characterize the pathogen by extending genomic sequence and the using phylogenetic analyses to determine how the sequence compares to known relatives. Using NGS will also allow us to determine whether the patient (or animal) is infected with additional pathogens. Specimens positive for any new pathogens via NGS will be confirmed via singleplex real-time PCR; findings will support the design of more refined single-plex PCR tests, a diagnostic mode already in routine use at LIBR, and potential refinement of the TAC assays. We estimate that ~10% of samples will be negative by TAC and will run these through NGS, pooled by three, to assess for novel pathogens.

	Pathogens of Interest	Major animal host(s) of interest
Virus	Zaire ebola	Bats, dogs
	Bombali	Bats
	Lassa	Rodents
	Marburg	Bats
	Crimean-Congo Hem. fever	Bats, rodents, ungulates
	Rift Valley fever	Bats, rodents, ungulates, dogs
	Monkeypox	Rodents
	Influenza	Bats, rodents, ungulates, dogs, poultry
	Dengue	Dogs
	West Nile fever	Bats, rodents, ungulates, dogs
	Chikungunya	Rodents
	Hepatitis B	n/a
	Hepatitis E	Rodents, chickens
Viral family	Arenavirus	Rodents
	Bunyavirus	Bats, rodents, ungulates, dogs, poultry
	Coronavirus	Bats, rodents, ungulates, dogs
	Filovirus	Bats, rodents, dogs
	Flavivirus	Bats
	Paramyxovirus	Bats, rodents, ungulates, dogs, poultry
	Poxvirus	Bats, rodents, ungulates, dogs
	Togavirus	Bats, rodents
Bacteria	*Coxiella burnetti*	Rodents, ungulates, dogs
	Yersinia pestis	Rodents, dogs, cats
	Brucella spp.	Rodents, ungulates, dogs
	Burkholderia mallei	Rodents, ungulates, dogs
	Burkholderia pseudomallei	Rodents, ungulates, dogs
	Leptospira spp.	Bats, rodents, ungulates, dogs
	Salmonella enterica	n/a
	Salmonella enterica serovar Typhi	n/a
	Neisseria meningitidis	n/a
	Borrelia spp.	Rodents, dogs
	Rickettsia spp.	Bats, rodents, ungulates, dogs
Protozoa	*Plasmodium spp.*	n/a
	Trypanosoma spp.	Rodents, ungulates, dogs
	Leishmania spp.	Bats, rodents, ungulates, dogs

Extraction of RNA/DNA using commercial kits lyses the viruses and bacteria and thus can be handled at BSL-2 conditions; any other steps prior to deactivation of the samples will be

performed under BSL2+ conditions, inside a BSL-3 biosafety cabinet. Aliquots of all samples, extractions, and serological preparations will be inventoried and stored in a dedicated, secure, on-site -80°C freezer for potential later project use and analysis. Biobank sample repository information and associated metadata will be maintained in a database developed by EHA. Consistent with BTRP guidance, we will ensure all samples are destroyed at the end of the project period pursuant to and consistent with Select Agent Program[28] and BMBL 5th edition protocols.[25]
Resources: EHA: One (1) scientist to participate as observer in laboratory training workshops; general project oversight; data management. UNMC: One (1) scientist to order/oversee ordering of equipment and consumables for LIBR. Two (2) scientists to conduct five-day in-country laboratory training workshop mid-Y1. In addition, one (1) lead scientist will be available outside the workshops throughout the project until the trainees are competent at each test the project requires. NPHIL and MOA: Two (2) lab technicians from each agency (4 total) to be trained and to conduct sample processing.
Metrics of success: Number and type of equipment provided to NPHIL; number of laboratorians trained and completion date of training; number and kind of tests in which trainees become competent; UNMC progress reports demonstrating new skillsets learned and areas for improvement; number of samples processed; number of pathogens/pathogen families identified.
Deliverables: Equipment and consumables provided to laboratory; training workshop completed; annual report-outs from training team at the annual stakeholder meetings; annual report-outs from trainees at annual stakeholder meetings demonstrating new techniques and competencies gained in prior year; data reports on tested samples.
Subtasks: (Format: Year#.Task#.Subtask#)

1.3.1 Provide necessary equipment and consumables to NPHIL laboratory (continuous)
1.3.2 Conduct Workshop 3a: laboratory biosafety and biosecurity, sample disposition
1.3.3 Conduct Workshop 3b: laboratory sample testing techniques
1.3.4 Provide continuous on-the-job training in laboratory techniques
1.3.5 Submit annual report

Task 4: Undertake preliminary animal sampling

Description and Execution: While laboratory training is beginning, preliminary field animal sampling will begin in Y1 with sampling in communities selected based on previous cases of AFI from historical hospital admissions trends, including some communities from which the study site hospitals draw patients. We will review a sampling of hospital records from Monrovia and Bong in search of geographic trends in AFI presentations going back three years, and begin randomized sampling of peridomestic and wild animals in four communities identified as part of this process and continue every three months. In five-day/five-night trips we will target approximately 50 bats, 50 rodents, 50 livestock (including chickens if poultry-transmitted infection is suspected), and 10 dogs per sampling event, allowing for approximately 640 animals sampled in Y1 to include blood and oral/nasopharyngeal specimens, and feces and urine when possible. Samples will be processed on site as outlined in Attachment 3. Our teams are trained in species identification, and we will also plan to barcode approximately 5% of individual bats and rodents in Y1 to improve species determination and team training. All animals will be non-lethally sampled with strict adherence to U.S. IACUC-approved protocols following those currently used by EHA scientists globally (Attachment 3) and using bat and rodent sampling protocols we developed for the PREDICT project (Attachment 3). All personnel undertaking animal sampling will be will be trained to ensure competency with a combination of didactic and practical training. SCNL will transfer samples to LIBR consistent with PREDICT protocols (Attachment 3).

Resources: EHA: One US-based (1) veterinarian (up to three Liberia trips per year) and one (1) EHA veterinarian based in Liberia; one (1) disease ecologist to take part in some of the trips and help oversee approach; one (1) scientist to oversee human subjects data collection. SCNL: One (1) lead scientist (for some trips) plus four (4) field technicians, one (1) social scientist, and two (2) drivers per sampling trip. LCRP: One (1) veterinarian for oversight and participation in some collection events. Other: At least one (1) MOA veterinary technician and one (1) student (e.g., University of Liberia) trained on as many of the sampling trips as possible.
Metrics of success: Number of animals sampled; number of samples successfully delivered to LIBR for processing; percentage of tests successfully completed; at least one veterinary technician trained; at least one student trained.
Deliverables: Blood and other biological samples to LIBR for processing.
Subtasks: (Format: Year#.Task#.Subtask#)
1.4.1 Conduct Workshop 4a: IACUC/animal subjects research
1.4.2 Review hospital records in search of geographic trends in acute febrile illness presentations
1.4.3 Sample in communities identified as part of this process and continue every three months

Year 2

Task 2: Continued: Enroll human patients and undertake sampling

Description and Execution: Same as Year 1, Task 2, with reduced focus on training and placing staff and more on continued implementation of study protocol.
Resources: MOH: One (1) project coordinator at each clinical site and one (1) clinical laboratory technician at each clinical site. SCNL: One (1) driver to transport samples.
Metrics of success: Number of patients enrolled; presence of project coordinators at each study site; number of patients enrolled; number of samples sent to LIBR.
Deliverables: Enrollment of patients into the study; completion of workshop on results interpretation to include advanced bioinformatics.
Subtasks: (Format: Year#.Task#.Subtask#)
2.2.2 Locally-hired project coordinator reports to hospital at each study site
2.2.3 Enroll patients (continuous)

Task 3: Continued: Undertake sample processing and testing

Description and Execution: Same as Year 1, Task 3 for human samples. With the addition of animal samples per Year 1, Task 4: MOA technicians (trained under Task 1.3.2 and 1.3.3) will lead sample processing with oversight from NPHIL project laboratory coordinator and UNMC. We will prioritize ELISA-based serology on the animal samples, using specific tests based on pathogens of relevance in that species to will increase our opportunity to detect key pathogens by applying serological techniques.[17] Serological assays are available for most of the pathogens of interest; we expect to average five ELISAs per sample and will pool by five. A subset of animal samples (10% pooled by three) will also be screened for the same pathogens using NGS, particularly important for testing Hypotheses 2 and 3 assessing shared zoonotic pathogens and characterizing phylogenetic relatedness and therefore potential evidence of transmission. Positives will be confirmed via singleplex PCR.
With the addition of human serology samples per Year 2, Task 5: We will run specific ELISA-based assays on patients' convalescent serum and on community members' serum (ELISAs are available for all pathogens of interest, either commercially or from research laboratories).
Resources: Same as Year 1, Task 3
Metrics of success: Number and kind of tests in which trainees become competent; self-reported trainee progress reports demonstrating new skillsets learned; number and kind of tests in which

trainees become competent; UNMC progress reports demonstrating new skillsets learned and areas for improvement; number of samples processed; number of pathogens/pathogen families identified.

Deliverables: Same as Year 1, Task 3

Subtasks: (Format: Year#.Task#.Subtask#)

2.3.1 Provide necessary equipment and consumables to NPHIL laboratory (continuous)

2.3.4 Provide on-the-job training in laboratory techniques (continuous)

2.3.5 Submit annual report

2.3.6 Conduct Workshop 5a: Host workshop on results interpretation/bioinformatics

Task 5: Visit communities: human-animal interface assessment, animal sampling, and human serology

Description and Execution: Study design: Animal sampling will continue in Y2, expanding to communities of enrolled patients, sampling in and around study enrollees' homes and surrounding areas; we plan to reach three communities in Y2 . This task predominantly supports Hypothesis 3. It is designed to: a) assess the risk interface between people and animals; b) strategically target and sample animal species for the pathogens/antibodies they are most likely to have based on what is already known about pathogen-host proclivity; and c) enable follow-up serology on patients and their community neighbors. Specifics of the design are provided for each goal.

a. Human-animal interface assessment: As patients begin enrolling (by Y1 Q4) they will be informed about the potential study follow-up; those that test positive for a zoonotic pathogen per Task 3 will qualify for a follow-up visit. With their agreement, they will participate in a second, more detailed human-animal interface questionnaire (assessing variables such as age, occupation, species and location of owned animals, type and frequency of animal contact (livestock and wildlife), perceptions and knowledge of zoonotic disease). The expected percentage of positive patients for other than malaria will likely maximize at ~10% based on published studies in other countries (and unpublished PREDICT data for Liberia, <10%),[2,26,29] although some bacterial agents could push that number higher.[13] We expect most of the positives to cluster geographically and will visit a total of five communities with the highest incidence of positives, targeting 20 humans and 400 animals (which may be split by more than one taxon) per community. These visits will occur every 2-3 months, ideally within 1-2 months of recognizing the cluster, but certainly within 12 months as we will be looking for serological (IgG) evidence of the same pathogens in the animal populations. At the start of the visit, an SCNL team member will administer a questionnaire (collecting responses on a tablet) to assess potential risk factors and enable characterization of the frequency and nature of animal exposure. The questionnaires will be designed by study staff experienced in survey development and implementation in LMIC and in infectious disease contexts in particular.

b. Animal sampling: With consent of the animal's owner, we will sample the patient's animals and animals living peridomestically; in addition, we will sample owned, peridomestic, and wild animals in and near the community. The goal is comprehensive sampling of community animals. This will be a cross-sectional study of animals in communities where evidence (based on lab findings) exists of zoonotic infection. Sampling is designed to maximize the detection of rare pathogens and answering questions about the relative proportion of febrile illness caused by each. If the 400 animals in each community are sampled across up to four taxa (100 each), we will be able to detect pathogen seroprevalence in each taxon/community as low as 3% with 95% power, with greater power when targeting fewer than four taxa per community. For detailed capture and sampling methods, see Year 1 Task 4, modified to reflect sampling targeted toward patients. In

areas where patients frequent (such as fields, livestock grazing areas, hunting grounds, etc.), we will perform line transects or a grid within each; average trapping success in rainy season is 13% and 8% in dry season for peridomestic animals; for domestic animals can be as high as 50% all year if traps are adapted.

c. Human serology: We will follow up with the patient and with their reaffirmed consent we will collect a blood specimen. We will also enroll up to 20 consenting community members from which to collect a biological blood specimen for serological testing (specific ELISAs) and administer the questionnaire on animal contact. The follow-up sampling in the patient will enable us to confirm the previous diagnosis (empirical or PCR-based); and to compare it to the serologic profile of the animals. Sampling the surrounding community members will give insight into the antibody profile of the community members, those with historical exposure, those where exposure did not progress to disease, and those who did not go to a participating research hopsital. This combined with the questionnaire on animal contact will provide strong evidence, where it exists, of spillover. Serology may be important as a correlate for infection risk; for detecting circulation of the pathogen in the absence of clinical illness; and for considering "prevalence of exposure" since we know certain antibodies can persist over time.

Resources: Same as Year 1, Task 4 with the addition of one (1) EHA scientist to oversee human subjects data collection.

Metrics of success: Number of animals sampled; number of samples successfully delivered to LIBR for processing; percentage of tests successfully completed; at least one veterinary technician trained; at least one student trained.

Deliverables: Blood and other biological samples to LIBR for processing.

Subtasks: (Format: Year#.Task#.Subtask#)

2.5.1 Review study patient records for geographic trends in AFI presentations
2.5.2 Undertake sampling in and around study enrollees' homes
2.5.3 Undertake sampling from broader patients' communities
2.5.4 Administer human-animal interface assessment
2.5.5 Collect human samples for serology

Task 6: Analyze data

Description and Execution: We will compare any diagnoses established at the clinical sites to laboratory results; and compare clinical study site diagnoses and laboratory results to national weekly and monthly county surveillance records. We will estimate population in catchment areas (from where the patient population comes) to develop prevalence estimates of each detected pathogen. We will compare phylogenetic sequence data from humans and animals to identify possible shared strains and infer transmission. Using the questionnaire data comparisons of exposure variables across varying demographics measures in study sites will be conducted to characterize high risk behaviors and statistical analysis will be employed to identify differences between groups with a 95% probability of detecting a difference. As appropriate, multivariate analysis will be utilized to evaluate the relationship between the positive biological findings and key measures of contact to evaluate the factors that influence and may have led to AFI pathogen exposure. The pathogen and human interface data collected in this study; characterization of zoonotic potential through phylogenetic analyses undertaken in this and other studies (such as PREDICT); and additional data such as available spatial, ecological, and environmental data will inform models designed to help tease correlation from causation. Understanding the diversity of circulating pathogens in animals and the behavioral interactions between people and animals can

inform risk mitigation;[17] the data will thus provide the foundation of an OY2 risk reduction workshop (see that section for more detail).
Resources: EHA: Four (4) scientists to analyze data and prepare summaries. NPHIL, MOH, MOA: Up to three (3) scientists representing one from each entity to assist with analysis. UNMC: One (1) scientist to assist with analysis. GU: One (1) scientist to assist with analysis.
Metrics of success: Development of research analyses and compilations for sharing with partners; completion of annual reports to DTRA; specimens shared with other researchers.
Deliverables: Annual stakeholders meeting; annual report to DTRA.
Subtasks: (Format: Year#.Task#.Subtask#)
2.6.1 Undertake data analysis

Task 7: Disseminate information to stakeholders
Description and Execution: We will host the annual stakeholders meeting to which we will invite all project partners as well as others doing related research in country. We will discuss preliminary data and analyses and use these to inform any needed modifications to forward sampling strategy. We will review protocols for biosafety, specimen transport, and animal handling at each annual meeting. We will provide support travel for at least one (1) Liberian scientist to present at an international conference. We will share samples as appropriate with other in-country projects to ensure synergies. We will compile and summarize research results and share with all partners and other in-country researchers as appropriate and use it to develop an annual report for DTRA.
Resources: EHA: Four (4) scientists to prepare summaries, present at annual meetings and other conferences, prepare annual report to DTRA, host annual meeting. NPHIL, MOH, MOA: Up to three (3) scientists representing one from each entity to assist with writing and presenting; up to one (1) scientist to present at an international conference. LCRP, UNMC, GU: One (1) scientist to assist with writing and presenting. Representatives from all partners to attend annual meeting.
Metrics of success: Development of compilations for sharing with partners; completion of annual reports to DTRA; specimens shared with other researchers
Deliverables: Annual stakeholders meeting; annual report to DTRA
Subtasks: (Format: Year#.Task#.Subtask#)
2.7.1 Host annual stakeholders meeting
2.7.2 Present to DTRA at Annual Technical Review
2.7.3 Submit annual report
2.7.4 Share specimens if available and appropriate with other in-country researchers
2.7.5 Support Liberian scientist to present at international conference

Year 3
Task 2: Continued: Enroll human patients and undertake sampling
Description and Execution, Resources, Metrics of success, Deliverables, Subtasks: Same as Year 2, Task 2
Task 3: Continued: Undertake sample processing and testing
Same as Year 2, Task 3 minus analytics workshop. Addition of one (1) post-doc to the laboratory to work on this project half-time and attend training in the United States at UNMC for one month.
Task 5: Continued: Visit communities: human-animal interface assessment, animal sampling, and human serology
Description and Execution, Resources, Metrics of success, Deliverables: Same as Year 2, Task 5. We plan to reach two communities in Y2.
Subtasks: (Format: Year#.Task#.Subtask#)
Task 6: Continued: Analyze data

Description and Execution: Same as Year 2, Task 6. We will also compare diagnostic results for endemic agents to reports for these diagnoses in the preceding years to allow for control for any changed practices (even if subconscious) in our target counties based on the project team's presence; this will also allow for a controlled comparison of the impact on incidence of any differential diagnosis or testing interventions we may implement in OY1 and OY2. MOH and CVL will lead the selection of Liberian laboratorians and at least one (1) Liberian student for analytics trainings; train in-country in basic bioinformatics analysis. We will develop recommendations for adapted differential diagnostic protocols and testing practices.
Resources, Metrics of success, Deliverables, Subtasks: Same as Year 2, Task 6

Task 7: Continued: Disseminate information to stakeholders

Description and Execution: Same as Year 2, Task 7. Broaden annual stakeholders meeting to include regional partners from Guinea and possibly other adjacent countries; share information about ongoing research; plan cross-border study for OY1. Importantly, broaden outreach to communities that have engaged in sampling to share results and discuss preliminary risk mitigation strategies.
Resources, Metrics of success, Deliverables: Same as Year 2, Task 7
Subtasks: (Format: Year#.Task#.Subtask#)
Same as Year 2, Task 7 minus Liberian conference travel, and with the addition of:

3.7.6 Host regional technical and networking workshop (concurrent with Subtask 3.6.1)
3.7.7 Prepare/submit up to two (2) peer-reviewed manuscripts
3.7.8 Engage sampled communities for follow-up education

Option Year 1

Task 2: Continued: Enroll human patients and undertake sampling

Same as Year 1, Task 2 with following difference:
Description and Execution: Same as Year 1, Task 2 except enrollment will occur in two new county clinical sites enabling broader geographical data capture including a border region with Guinea. Pending human and animal research results in Y1-3 and review of relevant infectious disease reporting country-wide, we will likely work in: 1) Ganta, a large city in Nimba county which borders Guinea, and a county in which mining activity hypothetically presents increased risk of bat-borne zoonoses; and 2) Lofa county, which shares a large border with both Guinea and Sierra Leone. The clinical studies in Monrovia and Bong will draw down at the end of Y3 once patient targets are reached. Should sufficient diagnostic data be available at this stage to inform improved clinical intake and diagnostic protocols, we will implement an intervention in one of the two hospitals and compare outcomes in the intervention location. Data will not be directly comparable since sites are unique (variations in community occupational hazards, pathogen prevalence in animal populations, etc.) but this approach may provide an opportunity for a preliminary assessment of how well an intervention could improve diagnostic test choice and accuracy of results. With a shorter timeframe for collecting data, if hospital studies in OY1 and the first quarter of OY2 generate 750 patients, our power for accurate prevalence measurement goes from 90% to 80% and the rare prevalence we are likely to detect at 95% power goes from 0.2% to 0.4%.

Task 3: Continued: Undertake sample processing and testing

Same as Year 3, Task 3

Task 5: Continued: Visit communities: human-animal interface assessment, animal sampling, and human serology

Same as Year 3, Task 5. We expect to visit two communities in OY1.

Task 6: Continued: Analyze data
Same as Year 3, Task 6
Task 7: Continued: Disseminate information to stakeholders
Description and Execution: Same as Year 3, Task 7 minus regional workshop and community engagement. In addition, review findings to date on prevalence and transmission pathways and economic information for prevention and control options for acceptability and prioritization in preparation for OY2 risk reduction workshop.
Deliverables: Same as Year 3, Task 7.
Resources: Same as Year 3, Task 7 minus Liberian international conference travel.
Metrics of success and Subtasks: Same as Year 3, Task 7

Option Year 2
Task 2: Continued: Enroll human patients in the two new counties and undertake sampling
Description and Execution: Same as Year 1 Task 2. Sampling in Monrovia and Bong will have concluded (unless a decision has been made that more samples are needed or desired at this stage). Sampling in the two new counties will be complete by the middle of OY2. Analyze results of the clinical intervention and use them to develop guidelines for improved management of acute febrile illness diagnostic procedures; discuss at OY2 annual meeting.
Task 3: Continued: Undertake sample processing and testing
Same as Year 3, Task 3
Task 5: Continued: Visit communities: human-animal interface assessment, animal sampling, and human serology
Same as Year 2 Task 5, with sampling winding down within the first quarter of Y1. We are targeting one final sampling event in OY2.
Task 6: Continued: Analyze data
Same as Year 2, Task 5
Task 7: Continued: Disseminate information to stakeholders
Description and Execution: Same as Option Year 1, Task 7 with the addition of risk reduction workshop. Project data will provide the foundation of an OY2 risk reduction workshop at the annual meeting to engage multi-sectoral Liberian participants to review statistical evaluation of diagnostic data, identify key risk interfaces, assess economic options for prevention and control, and develop threat reduction measures. Workshop products include 1) development of priorities for refined PCR and serological tests based on study findings, 2) recommendations for an updated national surveillance and reporting strategy and plan, 3) inclusion of stakeholders (e.g., National Disaster Management Authority, the Forestry Development Authority, the Ministry of Finance) to consider options for risk and impact reduction and generate policy recommendations. In addition, community engagement will be especially important as the project ends; we will work with MOH and MOA to develop written educational products designed for laypersons to explain project results, community impact, and risk mitigation, and thank community members for their participation.
Resources: Same as Year 2, Task 7 with the addition of one (1) additional EHA scientist to conduct the risk reduction workshop
Metrics of success: Same as Year 2, Task 7 with the addition of completion of attendance at risk reduction workshop, tangible outcomes in the form of revised protocols, etc.
Deliverables: Annual stakeholders meeting; annual report to DTRA; completion of risk reduction workshop; development of risk reduction options, cost-benefit analysis, and policy recommendations tied to Liberia's multi-sectoral National Action Plan for Health Security.

Subtasks: (Format: Year#.Task#.Subtask#)
Same as Year 2, Task 7 with the addition of:
OY2.7.9 Conduct Workshop 6a: risk reduction (concurrent with annual stakeholders meeting)

V. PERFORMANCE SCHEDULE

Task	Y1	Y2	Y3	OY1	OY2
Task 1: Establish evidence-based research initiative for high-consequence pathogens in Liberia					
1.1 Refine and finalize human and animal study protocols					
1.2 Secure and finalize all research permits (human and animal)					
1.3 Assign MOH, NPHIL, and CVL staff to field and lab positions					
1.4 Host kick-off meeting in Liberia					
1.5 Conduct Workshop 1a: overall research protocol					
Task 2: Enroll human patients and undertake sampling					
2.1 Conduct Workshop 2a: IRB/human subjects research					
2.2 Local project coordinator reports to hospital at each study site					
2.3 Enroll patients (continuous)					
Task 3: Undertake sample processing and testing					
3.1 Provide equipment and consumables to LIBR					
3.2 Conduct Workshop 3a: biosafety/biosecurity, sample disp.					
3.3 Conduct Workshop 3b: laboratory sample testing techniques					
3.4 Provide on-the-job training in lab techniques (continuous)					
3.5 Submit Y1 annual report					
3.6 Conduct Workshop 5a: results interpretation, bioinformatics					
3.7 Host regional technical and networking workshop					
Task 4: Preliminary animal sampling					
4.1 Conduct Workshop 4a: IACUC/animal subjects research					
4.2 Review hospital records for geo. trends in AFI presentations					
4.3 Sample animals in select communities (preliminary)					
Task 5: Visit communities: interface assessment, animal sampling, human serology					
5.1 Review study patient records for geographic AFI trends					
5.2 Administer human-animal interface assessment					
5.3 Undertake animal sampling in/around study enrollees' homes					
5.4 Undertake animal sampling from patients' communities					
5.5 Collect human samples for serology					
Task 6: Analyze data					
6.1 Undertake data analysis					
Task 7: Disseminate research results to stakeholders					
7.1 Host annual Stakeholders meeting					
7.2 Present to DTRA at Annual Technical Review					
7.3 Submit annual report					
7.4 Share specimens if appropriate w/ other in-country researchers					
7.5 Support Liberian scientist to international conference					
7.6 Host regional technical and networking workshop					
7.7 Prepare/submit up to two (2) peer-reviewed manuscripts					
7.8 Engage sampled communities for follow-up education					
7.9 Conduct Workshop 6a: risk reduction workshop					

Confirmed Proposal Expiration Date: "EHA holds the proposal, to include proposed costs, firm for 180 days after the submission date as stated in the invitation to submit a full proposal."

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 1** **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,108.00	1.50			35,513.50	12,571.78	48,085.28
Project Role:	PI										
Dr.	Ellen		Carlin		147,420.00	6.00			73,710.00	26,093.34	99,803.34
Project Role:	Co PI										
Dr.	Jonathan		Epstein		170,888.00	1.00			14,240.67	5,041.20	19,281.87
Project Role:	Co-PI										
Dr.	Noam		Ross		91,740.00	0.60			4,587.00	1,623.80	6,210.80
Project Role:	Co Investigator										
	Catherine		Machalaba		83,790.00	1.00			6,982.50	2,471.81	9,454.31
Project Role:	Co-Investigator										
	Emily		Hagan		66,095.00	4.00			22,031.67	7,799.21	29,830.88
Project Role:	Co Investigator										
Dr.	Anne		Landsoit		75,500.00	1.20			7,550.00	2,672.72	10,222.72
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 222,889.18

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			27,853.00	9,859.96	37,712.96

1	**Total Number Other Personnel**	**Total Other Personnel**	37,712.96
		Total Salary, Wages and Fringe Benefits (A+B)	260,602.14

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	16,402.00
2.	Foreign Travel Costs	77,815.00
	Total Travel Cost	94,217.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	4,500.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	481,216.31
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	485,716.31

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	840,535.45

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - DC			114,982.12
Indirect - Subs			40,000.00
		Total Indirect Costs	154,982.12

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	995,517.57

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	995,517.57

L. Budget Justification

(Only attach one file.) 1239-Budget Justification_FRA_FINAL .p | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,108.00	1.50			37,289.18	13,200.37	50,489.55
Project Role:	PI										
Dr.	Ellen		Carlin		147,420.00	6.00			77,395.50	27,398.01	104,793.51
Project Role:	Co PI										
Dr.	Jonathan		Epstein		170,888.00	1.00			14,952.70	5,293.26	20,245.96
Project Role:	Co-PI										
Dr.	Noam		Ross		91,740.00	0.60			4,816.35	1,704.99	6,521.34
Project Role:	Co Investigator										
	Catherine		Machalaba		83,790.00	1.00			7,331.63	2,595.40	9,927.03
Project Role:	Co-Investigator										
	Emily		Hagan		66,095.00	4.00			22,692.62	8,033.19	30,725.81
Project Role:	Co Investigator										
Dr.	Anne		Laudisoit		75,500.00	1.20			7,927.50	2,806.34	10,733.84
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 233,437.04

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			29,245.65	10,352.96	39,598.61
1	**Total Number Other Personnel**					**Total Other Personnel**	39,598.61
						Total Salary, Wages and Fringe Benefits (A+B)	273,035.65

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	16,402.00
2.	Foreign Travel Costs	76,876.50
	Total Travel Cost	93,278.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	3,000.00
2.	Publication Costs	4,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	496,476.92
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	504,476.92

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	869,791.07

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect DC			119,460.52
		Total Indirect Costs	119,460.52

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	989,251.59

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	989,251.59

L. Budget Justification

(Only attach one file.) 1239 Budget Justification_EHA_FINAL .p

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,108.00	1.50			39,153.63	13,860.39	53,014.02
Project Role:	PI										
Dr.	Ellen		Carlin		147,420.00	6.00			81,285.28	28,767.91	110,053.19
Project Role:	Co PI										
Dr.	Jonathan		Epstein		170,888.00	1.00			15,700.34	5,557.92	21,258.26
Project Role:	Co-PI										
Dr.	Noam		Ross		91,740.00	0.60			5,037.17	1,790.24	6,847.41
Project Role:	Co Investigator										
	Catherine		Machalaba		83,790.00	1.00			7,698.21	2,725.17	10,423.38
Project Role:	Co-Investigator										
	Emily		Hagan		66,095.00	4.00			23,373.40	8,274.18	31,647.58
Project Role:	Co Investigator										
Dr.	Anne		Laudisoit		75,500.00	1.20			8,323.88	2,946.65	11,270.53
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 244,494.37

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			30,707.93	10,870.61	41,578.54
1	**Total Number Other Personnel**					**Total Other Personnel**	41,578.54
						Total Salary, Wages and Fringe Benefits (A+B)	286,072.91

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	16,402.00
2.	Foreign Travel Costs	74,229.50
	Total Travel Cost	90,631.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	4,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	492,263.96
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	497,263.96

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	873,968.37

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect DC			122,145.40
		Total Indirect Costs	122,145.40

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	996,113.77

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	996,113.77

L. Budget Justification

(Only attach one file.) 1239 Budget Justification_EHA_FINAL .p

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,108.00	1.50			41,111.30	14,553.41	55,664.71
Project Role:	PI										
Dr.	Ellen		Carlin		147,420.00	6.00			85,328.54	30,206.30	115,534.84
Project Role:	Co PI										
Dr.	Jonathan		Epstein		170,888.00	1.00			16,485.35	5,835.81	22,321.16
Project Role:	Co-PI										
Dr.	Noam		Ross		91,740.00	0.60			5,310.03	1,879.75	7,189.78
Project Role:	Co Investigator										
	Catherine		Machalaba		83,790.00	1.00			8,083.12	2,861.42	10,944.54
Project Role:	Co-Investigator										
	Emily		Hagan		66,095.00	4.00			24,074.60	8,522.41	32,597.01
Project Role:	Co Investigator										
Dr.	Anne		Laudisoit		75,500.00	1.20			8,740.07	3,093.98	11,834.05
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 256,086.11

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			32,243.33	11,414.14	43,657.47
1	**Total Number Other Personnel**					**Total Other Personnel**	43,657.47
						Total Salary, Wages and Fringe Benefits (A+B)	299,743.58

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	16,402.00
2.	Foreign Travel Costs	76,876.50
	Total Travel Cost	93,278.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	4,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	438,647.13
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	443,647.13

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	835,669.21

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect DC			127,047.06
		Total Indirect Costs	127,047.06

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	962,716.27

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	962,716.27

L. Budget Justification

(Only attach one file.) 1239 Budget Justification_EHA_FINAL .p

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,108.00	2.00			57,555.84	20,374.77	77,930.61
Project Role:	PI										
Dr.	Ellen		Carlin		147,420.00	6.00			89,594.97	31,716.62	121,311.59
Project Role:	Co PI										
Dr.	Jonathan		Epstein		170,888.00	1.00			17,309.62	6,127.61	23,437.23
Project Role:	Co-PI										
Dr.	Noam		Ross		91,740.00	1.00			9,292.55	3,289.56	12,582.11
Project Role:	Co Investigator										
	Catherine		Machalaba		83,790.00	2.00			16,974.54	6,008.39	22,983.53
Project Role:	Co-Investigator										
	Emily		Hagan		66,095.00	4.00			24,736.83	8,778.08	33,574.91
Project Role:	Co Investigator										
Dr.	Anne		Laudisoit		75,500.00	1.20			9,177.07	3,248.68	12,425.75
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 304,245.73

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			33,855.50	11,984.85	45,840.35
1	**Total Number Other Personnel**					**Total Other Personnel**	45,840.35
						Total Salary, Wages and Fringe Benefits (A+B)	350,086.08

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	16,402.00
2.	Foreign Travel Costs	78,549.00
	Total Travel Cost	94,951.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	4,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	375,169.92
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	380,169.92

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	825,207.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect DC			144,011.86
		Total Indirect Costs	144,011.86

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	969,218.86

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	969,218.86

L. Budget Justification

(Only attach one file.) 1239 Budget Justification_EHA_FINAL .p

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		1,261,152.43
Section B, Other Personnel		208,387.93
Total Number Other Personnel	5	
Total Salary, Wages and Fringe Benefits (A+B)		1,469,540.36
Section C, Equipment		
Section D, Travel		464,356.50
1. Domestic	82,010.00	
2. Foreign	382,346.50	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		2,311,274.24
1. Materials and Supplies	3,000.00	
2. Publication Costs	16,000.00	
3. Consultant Services	8,500.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	2,283,774.24	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		4,245,171.10
Section H, Indirect Costs		667,646.96
Section I, Total Direct and Indirect Costs (G + H)		4,912,818.06
Section J, Fee		
Section K, Total Costs and Fee (I + J)		4,912,818.06

OMB Number: 4040-0001
Expiration Date: 10/31/2019

10 YEAR R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Instructions: On this form, you will attach the 10 Year R&R Subaward Budget files for your grant application. Complete the subawardee budget(s) in accordance with the 10 Year R&R budget instructions. Please remember that any files you attach must be a PDF document.

Click here to extract the 10 Year R&R Subaward Budget Attachment

Important: Please attach your subawardee budget file(s) with the file name of the subawardee organization. Each file name must be unique.

1) Please attach Attachment 1	SCNL		Delete Attachment	View Attachment
2) Please attach Attachment 2	NPHIL		Delete Attachment	View Attachment
3) Please attach Attachment 3	LCRP		Delete Attachment	View Attachment
4) Please attach Attachment 4	UNMC		Delete Attachment	View Attachment
5) Please attach Attachment 5	GU-CGHS		Delete Attachment	View Attachment
6) Please attach Attachment 6		Add Attachment		
7) Please attach Attachment 7		Add Attachment		
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 559801360000 **Enter name of Organization:** Society for the Conservation of Nature of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Michael		Garbo			0.60			0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	12.00			10,800.00	0.00	10,800.00
1	Social Scientists	12.00			6,600.00	0.00	6,600.00
4	Field Technicians	12.00			26,400.00	0.00	26,400.00
2	Drivers	12.00			7,920.00	0.00	7,920.00
8	**Total Number Other Personnel**					**Total Other Personnel**	51,720.00

Total Salary, Wages and Fringe Benefits (A+B) 51,720.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Vehicle	40,000.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 40,000.00

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	32,600.00
2. Foreign Travel Costs	
Total Travel Cost	32,600.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	5,620.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	5,620.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	129,940.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		7,195.20
		Total Indirect Costs	7,195.20

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	137,135.20

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	137,135.20

L. Budget Justification

(Only attach one file.) 1275 Budget Justification_SCNL_FINAL.p [ ] Delete Attachment View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 559801360000 **Enter name of Organization:** Society for the Conservation of Nature of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Michael		Garbo			0.60			0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	12.00			10,800.00	0.00	10,800.00
1	Social Scientists	12.00			6,600.00	0.00	6,600.00
4	Field Technicians	12.00			26,400.00	0.00	26,400.00
2	Drivers	12.00			7,920.00	0.00	7,920.00
8	**Total Number Other Personnel**					**Total Other Personnel**	51,720.00

Total Salary, Wages and Fringe Benefits (A+B) 51,720.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	42,400.00
2. Foreign Travel Costs	
Total Travel Cost	42,400.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	32,400.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	32,400.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	126,520.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		10,121.60
		Total Indirect Costs	10,121.60

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	136,641.60

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	136,641.60

L. Budget Justification

(Only attach one file.) 1275 Budget Justification_SCNL_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 559801360000 **Enter name of Organization:** Society for the Conservation of Nature of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Michael		Garbo			0.60			0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	12.00			10,800.00	0.00	10,800.00
1	Social Scientists	12.00			6,600.00	0.00	6,600.00
4	Field Technicians	12.00			26,400.00	0.00	26,400.00
2	Drivers	12.00			7,920.00	0.00	7,920.00
8	**Total Number Other Personnel**					**Total Other Personnel**	51,720.00

Total Salary, Wages and Fringe Benefits (A+B) 51,720.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	32,600.00
2.	Foreign Travel Costs	
	Total Travel Cost	32,600.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	21,600.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	21,600.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	105,920.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		8,473.60
		Total Indirect Costs	8,473.60

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	114,393.60

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	114,393.60

L. Budget Justification

(Only attach one file.) 1275 Budget Justification_SCNL_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 559801360000 **Enter name of Organization:** Society for the Conservation of Nature of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Michael		Garbo			0.60			0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	12.00			10,800.00	0.00	10,800.00
1	Social Scientists	12.00			6,600.00	0.00	6,600.00
4	Field Technicians	12.00			26,400.00	0.00	26,400.00
2	Drivers	12.00			7,920.00	0.00	7,920.00
8	**Total Number Other Personnel**					**Total Other Personnel**	51,720.00

Total Salary, Wages and Fringe Benefits (A+B) 51,720.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	32,600.00
2.	Foreign Travel Costs	
	Total Travel Cost	32,600.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	21,600.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	21,600.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	105,920.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		8,473.60
		Total Indirect Costs	8,473.60

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	114,393.60

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	114,393.60

L. Budget Justification

(Only attach one file.) 1275 Budget Justification_SCNL_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 559801360000 **Enter name of Organization:** Society for the Conservation of Nature of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Mr.	Michael		Garbo			0.60			0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	12.00			10,800.00	0.00	10,800.00
1	Social Scientists	12.00			6,600.00	0.00	6,600.00
4	Field Technicians	12.00			26,400.00	0.00	26,400.00
2	Drivers	12.00			7,920.00	0.00	7,920.00
8	**Total Number Other Personnel**					**Total Other Personnel**	51,720.00

Total Salary, Wages and Fringe Benefits (A+B) 51,720.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	22,800.00
2. Foreign Travel Costs	
Total Travel Cost	22,800.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	10,800.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	10,800.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	85,320.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,825.60
		Total Indirect Costs	6,825.60

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	92,145.60

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	92,145.60

L. Budget Justification

(Only attach one file.) 1275 Budget Justification_SCNL_FINAL.p

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		0.00
Section B, Other Personnel		258,600.00
Total Number Other Personnel	40	
Total Salary, Wages and Fringe Benefits (A+B)		258,600.00
Section C, Equipment		40,000.00
Section D, Travel		163,000.00
1. Domestic	163,000.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		92,020.00
1. Materials and Supplies	92,020.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		553,620.00
Section H, Indirect Costs		41,089.60
Section I, Total Direct and Indirect Costs (G + H)		594,709.60
Section J, Fee		
Section K, Total Costs and Fee (I + J)		594,709.60

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561231830000 **Enter name of Organization:** National Public Health Institute of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Mosoka		Fallah		24,000.00	0.60			0.00	0.00	0.00
Project Role:	Co PI										
Dr.	Fatorma		Bolay		20,000.00	1.50			2,500.00	0.00	2,500.00
Project Role:	Co-Investigator										
Dr.	John		Dogba		24,000.00	1.50			3,000.00	0.00	3,000.00
Project Role:	Co Investigator										
Dr.	Bode		Shobayo		16,596.00	1.50			2,074.50	0.00	2,074.50
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,574.50

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
3	Undergraduate Students	12.00			3,000.00	0.00	3,000.00
1	Secretarial/Clerical	6.00			5,000.00	0.00	5,000.00
4	Lab Technicians	4.00			18,666.67	0.00	18,666.67
2	Hospital Project Coordinator	6.00			6,250.00	0.00	6,250.00
2	Hospital Lab Technicians	1.00			1,666.67	0.00	1,666.67

12	**Total Number Other Personnel**	**Total Other Personnel**	34,583.34
		Total Salary, Wages and Fringe Benefits (A+B)	42,157.84

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
-80C Freezer	25,000.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 25,000.00

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	15,677.66
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Laboratory Testing	54,907.20
9.	Meetings and Conferences	14,970.00
10.	Freezer Maintenance	500.00
	Total Other Direct Costs	86,054.86

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	153,212.70

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		15,321.27
		Total Indirect Costs	15,321.27

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	168,533.97

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	168,533.97

L. Budget Justification

(Only attach one file.) 1276-Budget Justification_NPHIL_FINAL.

Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961231830000 **Enter name of Organization:** National Public Health Institute of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Mosoka		Fallah		24,000.00	0.60			0.00	0.00	0.00
Project Role:	Co PI										
Dr.	Fatorma		Bolay		20,000.00	1.50			2,500.00	0.00	2,500.00
Project Role:	Co-Investigator										
Dr.	John		Dogba		24,000.00	1.50			3,000.00	0.00	3,000.00
Project Role:	Co Investigator										
Dr.	Bode		Shobayo		16,596.00	1.50			2,074.50	0.00	2,074.50
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,574.50

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
3	Undergraduate Students	12.00			3,000.00	0.00	3,000.00
1	Secretarial/Clerical	6.00			5,000.00	0.00	5,000.00
4	Lab Technicians	4.00			18,666.67	0.00	18,666.67
2	Hospital Project Coordinator	6.00			6,250.00	0.00	6,250.00
2	Hospital Lab Technicians	1.00			1,666.67	0.00	1,666.67

12	**Total Number Other Personnel**	**Total Other Personnel** 34,583.34
		Total Salary, Wages and Fringe Benefits (A+B) 42,157.84

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	6,038.50
	Total Travel Cost	6,038.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	5,200.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Laboratory Testing	137,827.50
9.	Meetings and Conferences	10,650.00
10.	Freezer Maintenance	500.00
	Total Other Direct Costs	154,177.50

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	202,373.84

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		20,237.38
		Total Indirect Costs	20,237.38

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	222,611.22

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	222,611.22

L. Budget Justification

(Only attach one file.) 1276-Budget Justification_NPHIL_FINAL.

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961231830000 **Enter name of Organization:** National Public Health Institute of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Mosoka		Fallah		24,000.00	0.60			0.00	0.00	0.00
Project Role:	Co PI										
Dr.	Fatorma		Bolay		20,000.00	1.50			2,500.00	0.00	2,500.00
Project Role:	Co-Investigator										
Dr.	John		Dogba		24,000.00	1.50			3,000.00	0.00	3,000.00
Project Role:	Co Investigator										
Dr.	Bode		Shobayo		16,596.00	1.50			2,074.50	0.00	2,074.50
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,574.50

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	6.00			5,000.00	0.00	5,000.00
	Graduate Students						
3	Undergraduate Students	12.00			3,000.00	0.00	3,000.00
1	Secretarial/Clerical	6.00			5,000.00	0.00	5,000.00
4	Lab Technicians	4.00			18,666.67	0.00	18,666.67
2	Hospital Project Coordinator	6.00			6,250.00	0.00	6,250.00
2	Hospital Lab Technicians	1.00			1,666.67	0.00	1,666.67
13	**Total Number Other Personnel**					**Total Other Personnel**	39,583.34

Total Salary, Wages and Fringe Benefits (A+B) 47,157.84

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	7,960.50
	Total Travel Cost	7,960.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	5,600.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Laboratory Testing	128,825.50
9.	Meetings and Conferences	12,420.00
10.	Freezer Maintenance	500.00
	Total Other Direct Costs	147,345.50

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	202,463.84

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		20,246.38
		Total Indirect Costs	20,246.38

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	222,710.22

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	222,710.22

L. Budget Justification

(Only attach one file.) 1276-Budget Justification_NPHIL_FINAL.

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561231830000 **Enter name of Organization:** National Public Health Institute of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Mosoka		Fallah		24,000.00	0.60			0.00	0.00	0.00
Project Role:	Co PI										
Dr.	Faforma		Bolay		20,000.00	1.50			2,500.00	0.00	2,500.00
Project Role:	Co-Investigator										
Dr.	John		Dogba		24,000.00	1.50			3,000.00	0.00	3,000.00
Project Role:	Co Investigator										
Dr.	Bode		Shobayo		16,596.00	1.50			2,074.50	0.00	2,074.50
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,574.50

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	6.00			5,000.00	0.00	5,000.00
	Graduate Students						
3	Undergraduate Students	12.00			3,000.00	0.00	3,000.00
1	Secretarial/Clerical	6.00			5,000.00	0.00	5,000.00
4	Lab Technicians	4.00			18,666.67	0.00	18,666.67
2	Hospital Project Coordinator	6.00			5,000.00	0.00	5,000.00
2	Hospital Lab Technicians	1.00			1,666.67	0.00	1,666.67
13	**Total Number Other Personnel**					**Total Other Personnel**	38,333.34
					Total Salary, Wages and Fringe Benefits (A+B)		45,907.84

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	15,600.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Laboratory Testing	95,032.38
9.	Meetings and Conferences	11,100.00
10.	Freezer Maintenance	500.00
	Total Other Direct Costs	122,232.38

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	168,140.22

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		16,814.02
		Total Indirect Costs	16,814.02

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	184,954.24

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	184,954.24

L. Budget Justification

(Only attach one file.) 1276-Budget Justification_NPHIL_FINAL.

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561231830000 **Enter name of Organization:** National Public Health Institute of Liberia

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Mosoka		Fallah		24,000.00	0.60			0.00	0.00	0.00
Project Role:	Co PI										
Dr.	Fatorma		Bolay		20,000.00	1.50			2,500.00	0.00	2,500.00
Project Role:	Co-Investigator										
Dr.	John		Dogba		24,000.00	1.50			3,000.00	0.00	3,000.00
Project Role:	Co Investigator										
Dr.	Bode		Shobayo		16,596.00	1.50			2,074.50	0.00	2,074.50
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,574.50

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	6.00			5,000.00	0.00	5,000.00
	Graduate Students						
3	Undergraduate Students	12.00			3,000.00	0.00	3,000.00
1	Secretarial/Clerical	6.00			5,000.00	0.00	5,000.00
4	Lab Technicians	4.00			18,666.67	0.00	18,666.67
2	Hospital Project Coordinator	3.00			2,500.00	0.00	2,500.00
2	Hospital Lab Technicians	1.00			1,666.67	0.00	1,666.67
13	**Total Number Other Personnel**					**Total Other Personnel**	35,833.34
					Total Salary, Wages and Fringe Benefits (A+B)		43,407.84

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	6,038.50
	Total Travel Cost	6,038.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	5,200.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Laboratory Testing	36,821.00
9.	Meetings and Conferences	14,150.00
10.	Freezer Maintenance	500.00
	Total Other Direct Costs	56,671.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	106,117.34

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		10,611.73
		Total Indirect Costs	10,611.73

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	116,729.07

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	116,729.07

L. Budget Justification

(Only attach one file.) 1276-Budget Justification_NPHIL_FINAL.

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		37,872.50
Section B, Other Personnel		182,916.70
Total Number Other Personnel	63	
Total Salary, Wages and Fringe Benefits (A+B)		220,789.20
Section C, Equipment		25,000.00
Section D, Travel		20,037.50
1. Domestic		
2. Foreign	20,037.50	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		566,481.24
1. Materials and Supplies	47,277.66	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	453,413.58	
9. Other 2	63,290.00	
10. Other 3	2,500.00	
Section G, Direct Costs (A thru F)		832,307.94
Section H, Indirect Costs		83,230.78
Section I, Total Direct and Indirect Costs (G + H)		915,538.72
Section J, Fee		
Section K, Total Costs and Fee (I + J)		915,538.72

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 000000000000 **Enter name of Organization:** Liberia Chimpanzee Rescue & Protection

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	James		Desmond		135,000.00	6.00			67,500.00	0.00	67,500.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 67,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 67,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,312.00
	Total Travel Cost	8,312.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	3,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	3,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	78,812.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,304.96
		Total Indirect Costs	6,304.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	85,116.96

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	85,116.96

L. Budget Justification

(Only attach one file.) 1277 Budget Justification_LCRF_FINAL.p | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 000000000000 **Enter name of Organization:** Liberia Chimpanzee Rescue & Protection

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	James		Desmond		135,000.00	6.00			67,500.00	0.00	67,500.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 67,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 67,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,312.00
	Total Travel Cost	8,312.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	75,812.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,064.96
		Total Indirect Costs	6,064.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	81,876.96

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	81,876.96

L. Budget Justification

(Only attach one file.) 1277 Budget Justification_LCRF_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 000000000000 **Enter name of Organization:** Liberia Chimpanzee Rescue & Protection

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	James		Desmond		135,000.00	6.00			67,500.00	0.00	67,500.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 67,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 67,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,312.00
	Total Travel Cost	8,312.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	75,812.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,064.96
		Total Indirect Costs	6,064.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	81,876.96

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	81,876.96

L. Budget Justification

(Only attach one file.) 1277 Budget Justification_LCRF_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 000000000000 **Enter name of Organization:** Liberia Chimpanzee Rescue & Protection

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	James		Desmond		135,000.00	6.00			67,500.00	0.00	67,500.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 67,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 67,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,312.00
	Total Travel Cost	8,312.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	75,812.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,064.96
		Total Indirect Costs	6,064.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	81,876.96

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	81,876.96

L. Budget Justification

(Only attach one file.) 1277 Budget Justification_LCRF_FINAL.p

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 000000000000 **Enter name of Organization:** Liberia Chimpanzee Rescue & Protection

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	James		Desmond		135,000.00	6.00			67,500.00	0.00	67,500.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 67,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 67,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,312.00
	Total Travel Cost	8,312.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	75,812.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		6,064.96
		Total Indirect Costs	6,064.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	81,876.96

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	81,876.96

L. Budget Justification

(Only attach one file.) 1277 Budget Justification_LCRF_FINAL.p

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		337,500.00
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		337,500.00
Section C, Equipment		
Section D, Travel		41,560.00
1. Domestic		
2. Foreign	41,560.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		3,000.00
1. Materials and Supplies	3,000.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		382,060.00
Section H, Indirect Costs		30,564.80
Section I, Total Direct and Indirect Costs (G + H)		412,624.80
Section J, Fee		
Section K, Total Costs and Fee (I + J)		412,624.80

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 9639083350000 **Enter name of Organization:** University of Nebraska Medical Center

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Michael		Wiley		112,746.00	1.20			11,274.60	3,145.61	14,420.21

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 14,420.21

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Training Coordinator	1.20			8,290.10	2,312.94	10,603.04
1	**Total Number Other Personnel**					**Total Other Personnel**	10,603.04

Total Salary, Wages and Fringe Benefits (A+B) 25,023.25

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	25,023.25

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	27.00		6,756.28
		Total Indirect Costs	6,756.28

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	31,779.53

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	31,779.53

L. Budget Justification

(Only attach one file.) 1278 Budget Justification_UNMC_ FINAL | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 9639083350000 **Enter name of Organization:** University of Nebraska Medical Center

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Michael		Wiley		112,746.00	1.20			11,612.84	3,239.98	14,852.82

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 14,852.82

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Training Coordinator	1.20			8,290.10	2,312.94	10,603.04
1	**Total Number Other Personnel**					**Total Other Personnel**	10,603.04

Total Salary, Wages and Fringe Benefits (A+B) 25,455.86

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	25,455.86

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	27.00		6,873.08
		Total Indirect Costs	6,873.08

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	32,328.94

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	32,328.94

L. Budget Justification

(Only attach one file.) 1278 Budget Justification_UNMC_ FINAL

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 9639083350000 **Enter name of Organization:** University of Nebraska Medical Center

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Michael		Miley		112,746.00	1.20			11,981.22	3,317.18	15,298.40

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 15,298.40

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Training Coordinator	1.20			8,290.10	2,312.94	10,603.04

1 **Total Number Other Personnel**

Total Other Personnel 10,603.04

Total Salary, Wages and Fringe Benefits (A+B) 25,901.44

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	25,901.44

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	27.00		6,993.39
		Total Indirect Costs	6,993.39

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	32,894.83

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	32,894.83

L. Budget Justification

(Only attach one file.) 1278 Budget Justification_UNMC_ FINAL.

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 9639083350000 **Enter name of Organization:** University of Nebraska Medical Center

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Michael		Wiley		112,746.00	1.20			12,320.06	3,437.30	15,757.36

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 15,757.36

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Training Coordinator	1.20			8,290.10	2,312.94	10,603.04

1 **Total Number Other Personnel**

Total Other Personnel 10,603.04

Total Salary, Wages and Fringe Benefits (A+B) 26,360.40

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	26,360.40

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	27.00		7,117.31
		Total Indirect Costs	7,117.31

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	33,477.71

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	33,477.71

L. Budget Justification

(Only attach one file.) 1278 Budget Justification_UNMC_ FINAL.

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 9638083350000 **Enter name of Organization:** University of Nebraska Medical Center

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Michael		Wiley		112,746.00	1.20			12,689.66	3,540.42	16,230.08

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 16,230.08

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Training Coordinator	1.20			8,290.10	2,312.94	10,603.04
1	**Total Number Other Personnel**					**Total Other Personnel**	10,603.04

Total Salary, Wages and Fringe Benefits (A+B) 26,833.12

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	26,833.12

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	27.00		7,244.94
		Total Indirect Costs	7,244.94

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	34,078.06

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	34,078.06

L. Budget Justification

(Only attach one file.) 1278 Budget Justification_UNMC_ FINAL.

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		76,558.87
Section B, Other Personnel		53,015.20
Total Number Other Personnel	5	
Total Salary, Wages and Fringe Benefits (A+B)		129,574.07
Section C, Equipment		
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		129,574.07
Section H, Indirect Costs		34,985.00
Section I, Total Direct and Indirect Costs (G + H)		164,559.07
Section J, Fee		
Section K, Total Costs and Fee (I + J)		164,559.07

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 049919944 000 **Enter name of Organization:** Georgetown University Ctr for Global Health Sci and Security

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Claire		Standley		108,101.00	1.20			10,819.10	3,170.00	13,989.10
Project Role:	Co Investigator										
Dr.	Erin		Sorrell		114,767.00	0.60			11,476.70	3,362.67	14,839.37
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 28,828.47

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 28,828.47

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,539.00
	Total Travel Cost	8,539.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	150.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Telecommunications	200.00
9.		
10.		
	Total Other Direct Costs	350.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	37,717.47

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	56.00		20,933.25
		Total Indirect Costs	20,933.25

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	58,650.72

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	58,650.72

L. Budget Justification

(Only attach one file.) 1279 Budget Justification_CU_FINAL.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 049515844 000 **Enter name of Organization:** Georgetown University Ctr for Global Health Sci and Security

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Claire		Standley		108,101.00	0.60			5,518.00	1,616.77	7,134.77
Project Role:	Co Investigator										
Dr.	Erin		Sorrell		114,767.00	0.60			5,833.00	1,734.93	7,567.93
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 14,702.70

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 14,702.70

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	50.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Telecommunications	50.00
9.	
10.	
Total Other Direct Costs	100.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	14,802.70

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	56.00		8,215.50
		Total Indirect Costs	8,215.50

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	23,018.20

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	23,018.20

L. Budget Justification

(Only attach one file.) 1279 Budget Justification_GU_FINAL.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 049515844 000 **Enter name of Organization:** Georgetown University Ctr for Global Health Sci and Security

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Claire		Standley		108,131.00	1.20			11,256.00	3,298.01	14,554.01
Project Role:	Co Investigator										
Dr.	Erin		Sorrell		114,767.00	0.60			5,970.00	1,749.21	7,719.21
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 22,273.22

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 22,273.22

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,500.00
	Total Travel Cost	3,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	150.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Telecommunications	50.00
9.		
10.		
	Total Other Direct Costs	200.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	25,973.22

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	56.00		14,415.14
		Total Indirect Costs	14,415.14

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	40,388.36

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	40,388.36

L. Budget Justification

(Only attach one file.) 1279 Budget Justification_GU_FINAL.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 049515844 000 **Enter name of Organization:** Georgetown University Ctr for Global Health Sci and Security

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Claire		Standley		108,101.00	0.60			5,741.00	1,682.11	7,423.11
Project Role:	Co Investigator										
Dr.	Erin		Sorrell		114,767.00	0.60			6,090.00	1,784.37	7,874.37
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 15,297.48

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 15,297.48

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	0.00
	Total Travel Cost	0.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	50.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Telecommunications	51.00
9.		
10.		
	Total Other Direct Costs	101.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	15,398.48

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	56.00		8,546.16
		Total Indirect Costs	8,546.16

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	23,944.64

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	23,944.64

L. Budget Justification

(Only attach one file.) 1279 Budget Justification_GU_FINAL.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 049515844 000 **Enter name of Organization:** Georgetown University Ctr for Global Health Sci and Security

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Claire		Standley		108,101.00	1.20			11,711.00	3,431.32	15,142.32
Project Role:	Co Investigator										
Dr.	Erin		Sorrell		114,767.00	0.60			6,211.00	1,819.82	8,030.82
Project Role:	Co-Investigator										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 23,173.14

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 23,173.14

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	8,800.00
Total Travel Cost	8,800.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	200.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Telecommunications	200.00
9.	
10.	
Total Other Direct Costs	400.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	32,373.14

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	56.00		17,967.10
		Total Indirect Costs	17,967.10

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	50,340.24

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	50,340.24

L. Budget Justification

(Only attach one file.) 1279 Budget Justification_GU_FINAL.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		104,275.01
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		104,275.01
Section C, Equipment		
Section D, Travel		20,839.00
1. Domestic		
2. Foreign	20,839.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		1,151.00
1. Materials and Supplies	600.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	551.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		126,265.01
Section H, Indirect Costs		70,077.15
Section I, Total Direct and Indirect Costs (G + H)		196,342.16
Section J, Fee		
Section K, Total Costs and Fee (I + J)		196,342.16

BUDGET JUSTIFICATION FOR ECOHEALTH ALLIANCE

EcoHealth Alliance requests a total of $4,912,818 over all-years of the proposed project to support personnel, travel, equipment, consortium agreements, and applicable indirect costs.

A. Key Personnel

William B. Karesh, D.V.M., Principal Investigator (1.5 calendar months for all years). Dr. Karesh will be responsible for the overall coordination of this project. He will provide overall project oversight, study design development and refinement, data analysis, publication support, and annual stakeholder meeting participation. We request $35,513 in Y1 with a 5% cost of living increase each subsequent year.

Ellen P. Carlin, D.V.M., Co-Investigator (6.0 calendar months in all years). Dr. Carlin will provide day-to-day project development and strategic management, including through regular in-person meetings and weekly phone and other direct communications with partners. She will also supervise field sampling, data analysis, and data and information dissemination through workshops, conferences, and papers. We request $73,710 in Y1 with a 5% cost of living increase each subsequent year.

Jonathan Epstein, Ph.D., Co-Investigator (1.0 calendar month in all years). Dr. Epstein will be a technical advisor to the project, advising on data interpretation, targeted animal sampling based on data as they come in over the course of the project, and laboratory techniques. He will also assist with writing and dissemination. We request $14,241 in Y1 with a 5% cost of living increase each subsequent year.

Anne Laudisoit, Ph.D. Senior Ecologist (1.2 calendar months in all years). Ms. Laudisoit will assist with data organization, analysis, and writing with a focus on ecological strategies to maximize animal sampling data collection and creating an evidence basis through this sampling to infectious pathogen transmission dynamics. We request $7,550 in Y1 with a 5% cost of living increase each subsequent year.

Noam Ross, Ph.D., Senior Research Scientist, Modeler (0.6 calendar months in all years). Dr. Ross will be a technical advisor to the project, advising on data organization, analysis, and writing with a focus on statistical analytics. We request $4,587 in Y1 with a 5% cost of living increase each subsequent year.

Emily Hagan, M.P.H., Behavioral Risk Scientist (4.0 calendar months in all years). Ms. Hagan will provide medical anthropology expertise for the questionnaires and analysis, supervise and conduct the IRB processes and trainings on the human subject work for local partners, and assist with data organization and analysis. We request $22,031 in Y1 with a 5% cost of living increase each subsequent year.

Catherine Machalaba, M.P.H, Policy Advisor (1.0 calendar months in all years), 2 calendar months for OY2). Ms. Machalaba will be a technical advisor to the project, advising on study design and risk reduction. She will conduct a risk reduction workshop in OY2 and will help develop revised biosurveillance and reporting strategies with and for Liberian partners. We request $6,983 in Y1 with a 5% cost of living increase each subsequent year.

B. Other Personnel
Amanda Andre, LMSW, Operations Assistant (6 calendar months in all years). Ms. Andre will be the administrative lead handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics. She will coordinate all meetings and travel and ensure compliance with funding and contractual requirements. We request $27,853 in Y1 with a 5% cost of living increase each subsequent year.

Fringe Benefits
Fringe benefits are calculated as 35% of base salary p.a. with $68,134 requested in Y1 calculated from the base salary for all Personnel. In Y2 – OY2, we budget for a 5% per year cost of living allowance increase in all salaries.

C. Equipment
No funds are requested for equipment.

D. Travel
Domestic Travel
Domestic travel is requested for one trip per year for program staff to travel from New York City to Washington, DC to meet with Co-Investigator Carlin and key personnel at Georgetown University; and for Co-Investigator Carlin to travel to New York City from Washington, DC four times per year to collaborate with EcoHealth Alliance program staff in the New York office. Transportation is estimated at $300 per trip along with the government GSA per diem rates for each city. Additional domestic travel support will facilitate two EcoHealth Alliance staff presenting at two domestic conferences annually. In total, we are requesting $16,402 in each year of our proposed work.

International Travel
Foreign travel is requested for partner meetings, in-country trainings, and field research. Six EHA employees as well as three partners from UNMC and GU will attend annual meetings. Two to three EHA staff and two partners from UNMC will make a second trip each year for trainings and field research; in OY2, one additional staff scientist will travel to Liberia to conduct a risk reduction workshop. Flights for each of these trips is estimated at $3,000 and the federal per diem rates of $200 for lodging in Monrovia, Liberia and $70 for field work as well as the $95 for meals in Monrovia, Liberia and $46 for field work are requested. Additionally, we are requesting travel for staff to present on project findings at international conferences each year with flights estimated at $1,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria for International Meeting on Emerging Diseases and Surveillance (IMED). Travel costs are increased 5% each year to account for pricing increases based upon past, actual, annual price increases.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
Co-Investigator Carlin will need a new computer, equipped with Microsoft and Adobe software for which we request $3,000, in Y2.

Publication Costs
To facilitate the dissemination of project findings, $4,000 per year in only Y2-OY2 is requested for open access publication costs in international peer-reviewed journals.

Consultant Services
For the human behavioral risk part of the project, $1,000 is requested p.a Y1-OY2 for Hummingbird IRB and $3,500 in Y1 for required Collaborative Institutional Training Initiative training for personnel handling human and non-human animals and samples as per IRB and IACUC requirements.

Subawards/Consortium/Contractual Costs
Subcontracts for the National Public Health Institute of Liberia, Society for the Conservation of Nature-Liberia, Liberia Chimpanzee Rescue and Protection, University of Nebraska Medical Center and Georgetown University are outlined in their individual budget justifications.

H. Indirect Costs
We are requesting the EcoHealth Alliance federally approved indirect cost rate of 32% on all applicable direct costs. The USA Department of Defense's Department of the Navy has approved this rate on 17 July 2019. We have applied our indirect cost rate to the first $25,000 of the subcontracts only in Y1.

BUDGET JUSTIFICATION FOR LIBERIA CHIMPANZEE RESCUE AND PROTECTION, LIBERIA

Liberia Chimpanzee Rescue & Protection requests a total of $412,625 over all years of the proposed project to support personnel, travel, equipment, and indirect costs.

A. Key Personnel
James Desmond, D.V.M., Co-Investigator (6 calendar months for Y1-OY2). Dr. Desmond will oversee field sampling and training (along with Michael Garbo), and will assist with study design and analysis and dissemination of findings for which $67,500 is requested in Y1.

B. Other Personnel
No funds are requested for other personnel.

C. Equipment
No funds are requested for equipment.

D. Travel
International Travel
Foreign travel support will cover one trip p.a. to New York to meet with project collaborators for which flights are estimated at $3,000 along with the government GSA per diem rates for New York, New York. Travel support will be used for dissemination of project findings at one international conference p.a, with flights estimated at $2,000 along with the government GSA per diem rates. Combined international travel for Y1 is $8,312.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
We request $3,000 in Y1 for the purchase of a computer.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 8% on all direct costs.

BUDGET JUSTIFICATION FOR UNIVERSITY OF NEBRASKA MEDICAL CENTER, UNITED STATES

The University of Nebraska Medical Center (UNMC) requests a total of $164,559 over all years of the proposed project to support personnel and indirect costs.

A. Key Personnel
Michael R. Wiley, Ph.D., Co-Investigator (1.2 calendar month for Y1-OY2). Dr. Wiley will provide oversight of laboratory work including all necessary training (biosafety, biosecurity, and testing techniques, and analysis), quality control, assistance with inventory and ordering, and will also assist with study design, data analysis, and dissemination, for which $11,275 is requested in Y1, with a 3% increase each subsequent year.

Fringe Benefits
Fringe benefits are calculated as 27.9% of base salary p.a. with $3,145 requested in Y1 for Key Personnel.

B. Other Personnel
Catherine Pratt, Training Coordinator (1.2 calendar month for Y1- OY2). Ms. Pratt will assist with laboratory training and quality control for which $8,290 is requested in Y1.

Fringe Benefits
Fringe benefits are calculated as 27.9% of base salary p.a. with $2,313 requested in Y1 for Other Personnel.

C. Equipment
No funds are requested for equipment.

D. Travel
No funds are requested for travel.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
No funds are requested for other direct costs.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 27% on all direct costs.

BUDGET JUSTIFICATION FOR SOCIETY FOR CONSERVATION OF NATURE, LIBERIA

The Society for Conservation of Nature, Liberia (SCNL) requests a total of $594,710k over all years of the proposed project to support personnel, travel, equipment, and indirect costs.

A. Key Personnel
Michael Garbo, M.S., Co-Investigator (0.6 calendar months per year for all years). As head of SCNL, Mr. Garbo will be responsible for the oversight of all non-human animal sampling activities including preparation, staffing, implementation, and follow-up. He will further oversee the sample transport activity of both animal and human samples, for which SCNL is responsible. We do not request salary for him, since he will be fully covered by other SCNL funding sources.

B. Other Personnel
Annual support is requested for a social scientist ($550/month), four field technicians ($550/month each), and two drivers ($330/month each) to make up the field research team. This team will be responsible for all aspects of animal field sampling, including planning, ordering supplies, implementation, ensuring all samples are safely and securely transferred to LIBR for testing, and any needed follow-up. This team will also administer a survey to the patients whose community they visit, administer a similar questionnaire to up to twenty additional community members, and with consent collect blood samples from these individuals for serological testing SCNL employees at least one nurse who will be deployed for this purpose. Support is requested for two administrative assistants ($450/month) to assist with procurement, invoicing, scheduling, and field team logistics.

C. Equipment
A field vehicle for field sampling and sample transport is estimated at $40,000. Liberia does not currently have a VAT. Our conversations with Liberian partners indicate that it is unlikely that VAT will be instated in the near future. If it were, Government agencies and non-profits such as SCNL would be exempt from VAT.

D. Travel
Domestic Travel
Domestic travel support will cover fuel, vehicle maintenance ($700/month), lodging and per diems for overnight trips ($50/day) for eight field team members for four, week-long field sampling trips. Cost is calculated at $32,600 in Y1, Y3, and OY1. In Y2 the sampling trips will be for two-weeks in duration calculated at $42,000. In OY2, there will only be 1 trip for two-weeks calculated at $22,800.

In addition to transporting the animal samples that it collects in the field, SCNL will also be responsible for picking up and safely and securely transporting all human samples from the clinical study sites to the Liberian Institute for Biomedical Research via the standing cold chain procedures they follow for the animal samples. They will use their existing vehicles for this purpose. They will visit Redemption Hospital in Monrovia daily as required by sample volume and Phebe Hospital in Bong weekly at an estimated round-trip distance of 250 km total weekly. We request $13,000 per year in all years to cover fuel and vehicle maintenance for this function.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs

Materials and Supplies
We request $400 in Y1 for the purchase of two hand-held tablets to be utilized by the field research team for data collection and organization (animal and human). Tablets will be used to conduct surveys off-line in the field, and to upload the data collected upon returning to SCNL offices. We request $500 for the purchase of a tarp, spade and 40 pitfall traps for rodent sampling. We request $400 for the purchase of a centrifuge to enable processing of medium- and large-animal blood samples in preparation for serological testing.

Field consumables including gloves, Tyvek suits, vacutainers, syringes and needles, EDTA collection tubes, non-EDTA collection tubes, cryotubes, TRIzol, and swabs are needed to conduct field sampling. The budget for travel and consumables will enable us to test 3,360 animals over the course of the project (Y1: 160; Y2: 1,200; Y3: 800; OY1: 800; OY2: 400) and will cover a total of 12 sampling events (Y1: 4; Y2: 3; Y3: 2; OY1: 2; OY2: 1).

H. Indirect Costs
We are requesting a *de minims* rate of 8% on all allowable direct costs.

BUDGET JUSTIFICATION FOR GEORGETOWN UNIVERSITY CENTER FOR GLOBAL HEALTH AND SECURITY, UNITED STATES

The Georgetown University Center for Global Health and Security requests a total of $196,342 over all years of the proposed project to support personnel, travel, other direct costs, and indirect costs.

A. Key Personnel

Erin Sorrell, Ph.D., Co-Investigator (1.2 calendar months for Y1, .6 calendar months for Y2-OY2). Dr. Sorrell will provide subject matter expertise in support of the execution of the project, specifically related to study design and analysis and dissemination of findings for which $11,477 is requested in Y1, with a 2% increase each subsequent year. Dr. Sorrell's time will vary over the five years of the project based on involvement in specific tasks.

Claire Standley, Ph.D. Co-Investigator (1.2 calendar months for Y1, Y3, OY2, .6 calendar months for Y1, OY1). Dr. Standley will serve as the GU PI for the award, and will be the lead for all aspects of GU's contribution to the project, notably related to project design and analysis and dissemination of the findings for which $10,819 is requested in Y1, with a 2% increase each subsequent year. Dr. Standley's time will vary over the five years of the project based on involvement in specific tasks.

Fringe Benefits

Fringe benefits are calculated as 29% of base salary p.a. with $6,533 requested in Y1 for Key Personnel.

B. Other Personnel

No funds are requested for other personnel.

C. Equipment

No funds are requested for equipment.

D. Travel

International Travel

Foreign travel support will be used to support travel for two GU personnel to attend the kickoff meeting in Y1 and annual meeting in OY2, and for one GU personnel to attend the annual meeting in Y3. Flights are estimated at $3,000 along with the government GSA per diem rates for Monrovia, Liberia.

E. Participant/Trainee Support Costs

No funds are requested for participant or trainee support costs.

F. Other Direct Costs

Materials and Supplies

We request $600 over the five years of the project for miscellaneous supplies to support execution of the project, including stationery, printing, and other supplies.

Telecommunications

We request $500 over the five years of the project to support telecommunication costs (including Skype subscriptions/charge and mobile phone charges) for project communication, including roaming charges while on international travel in Liberia.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 56% on all direct costs.

BUDGET JUSTIFICATION FOR NATIONAL PUBLIC HEALTH INSTITUDE OF LIBERIA, LIBERIA

The National Public Health Institute of Liberia (NPHIL) requests a total of $910,955 over all years of the proposed project to support personnel, travel, equipment, other direct costs and indirect costs.

A. Key Personnel

Mosoka Fallah, Ph.D., Co-Investigator (.6 calendar month for Y1-OY2). Dr. Fallah will provide overall project oversight for Liberia-based activities. NPHIL is charged with leading all public health and biomedical research in Liberia, and Dr. Fallah assumes that role for this project, leading all elements on the human subjects research side of the project as well as the laboratory diagnostics elements. Dr. Fallah will ensure NPHIL meets project tasks and milestones, will oversee NPHIL's budget, and will assist with dissemination of findings through publications and conference presentations. We do not request salary at this time as Dr. Fallah will be fully covered by other funding sources during the project period.

Fatorma Bolay, Ph.D., Co-Investigator (1.5 calendar month for Y1-OY2). As head of the Liberia Institute for Biomedical Research (LIBR) at NPHIL, Dr. Bolay will provide direct oversight of all laboratory activity for the project, for which $2,500 is requested starting in Y1.

John Dogba, Ph.D. Candidate, Co-Investigator (1.5 calendar month for Y1-OY2). Dr. Dogba directs the national reference laboratory at NPHIL and will ensure compliance with biosafety and biosecurity project requirements; as a lecturer at the University of Liberia he will also assist with identification and recruitment of students to work in the laboratory, activities for which $3,000 is requested starting in Y1.

Bode Shobayo, M.S.C., Co-Investigator (1.5 calendar month for Y1-OY2). As a research scientist within NPHIL's medical and public health research division, Dr. Shobayo will participate in training workshops, processing and testing a subset of samples, and reporting recommendations to Dr. Bolay and Dr. Wiley for process refinements and mitigating challenges with the day-to-day laboratory workflow, for which $2,075 is requested starting in Y1.

B. Other Personnel

Laboratory Scientists/Technicians (4 calendar months for Y1-OY2). Four laboratory scientists and/or technicians—two from NPHIL and two seconded from the Ministry of Agriculture—will process and test all project samples at LIBR. They will participate in all laboratory workshops, provide all bench activity (under the supervision of key personnel), and advise on inventory needs and any problems implementing the laboratory protocol. We request $18,667 for all four laboratory technicians starting in Y1.

Hospital Project Coordinators (6 calendar months for Y1-OY2). One coordinator will be appointed to each of two human clinical study sites (Redemption Hospital and Phebe Hospital) operating in Y1-Y3. These coordinators will be chosen from existing staff already participating in other febrile illness studies at the hospitals and will be responsible for participating in human subjects research training, ensuring hospital staff are sensitized to our inclusion criteria (and thus able to identify proper candidates), being available for consultation when patients enroll in the study, collecting consent form and questionnaire data from the patients, and ensuring samples are collected, stored, and transported in timely fashion. Similarly, one coordinator will

be appointed to each of two human clinical study sites (hospitals in Nimba and Lofa counties) in the option years, if funded. In an effort to train and engage Liberian nurses in public health surveillance and in research, at least one and possibly both of these sites will be staffed through Nursing for All, a non-profit that builds capacity in the nursing profession in Liberia and is presently operating at Ganta United Methodist Hospital in Nimba, one of the sites at which we would like to implement the study in OY1-2. We request $26,250 over the proposed five years of the project.

Hospital Laboratory Technicians (1 calendar months for Y1-OY2). Hospital laboratory technicians will assist with initial processing of patient samples (spinning serum, labeling, and storing) prior to transport to NPHIL. We will similarly provide salary support for technicians at the two option year hospitals if funded. We request $1,667 p.a. for these activities.

Post-doctoral Researcher (6 calendar months for Y3-OY2). Beginning in Y3, we propose to add a post-doctoral researcher to the laboratory team. Liberia does not have a PhD-granting institution, but a number of Liberians are presently undertaking PhD degree programs outside of the country; by Y3 we plan to bring one Liberian individual who has received a PhD in laboratory pathogen research into the project to work with the laboratory scientists on sample processing, testing, and data analysis, for which we request $5,000 starting in Y3.

Bachelors and Masters Students. We intend to include approximately three students per semester on the project, to include undergraduate and graduate students from the University of Liberia (Monrovia) and Cuttington University (Bong). Their duties will depend on their degree program but will include assignments at the human clinical sites (nursing, medical, public health, anthropology students); animal field collection sites (biology, animal science, ecology, anthropology); and laboratory (molecular biology, microbiology). We will preferentially choose students interested in developing their theses based on the project. Each student will receive a stipend of $500 per semester.

Administrator/Program Manager (6 months in Y1-OY2). This individual will act as the administrative lead, handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics, activities for which we request $5,000 p.a.

C. Equipment

The existing freezer in which PREDICT samples are stored at LIBR will remain there when the project ends, and will be available for this project's use, but its capacity is limited. LIBR will therefore require increased storage capacity for the specimens generated by this project (2,250 humans, up to 4,500 specimens; 3,840 animals, up to 14,560 specimens). A -80°C freezer is requested for sample storage and is estimated at $25,000. Liberia does not have a VAT and our conversations with Liberian partners indicate it is unlikely they will instate one in the near future. Government agencies and non-profits would be exempt from any such tax. If absolutely necessary, we would seek unrestricted funding sources to cover any such costs.

D. Travel

We are requesting travel for one Liberian project participant to attend a regional conference and an international conference in Y3 and OY2 to present on project findings, with flights estimated. For the regional conference flights are estimated at $750 and hotels and meals at the government GSA per diem rates for Accra, Ghana. For the international conference flights are estimated at $2,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria.

In Y3 we plan to bring one Liberian individual who has received a PhD in laboratory pathogen research into the project to work with the laboratory scientists on sample processing, testing, and data analysis as a post-doctoral associate. We will fund a one-month trip for this individual to the University of Nebraska Medical Center to train in the laboratory of co-Investigator Dr. Michael Wiley. A flight is estimated at $3,000 and hotels and meals at the government GSA per diem rates for Omaha, Nebraska.

In total over the course of the project, we are requesting $20,038 in for International Travel.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
We will supply the participating hospitals with all consumables required to collect patient samples, including serum tubes, EDTA tubes, cryovials, vacutainer holder, needles, syringes, nitrile gloves, and nasal swabs, for which we request $2,378 p.a. Some supplies will be purchased in the United States and shipped to Liberia, for which we request $2,500 p.a. For the human clinical study implementation sites, our request also includes funding for a centrifuge to enable processing of serum at the hospital clinical laboratories ($400 each), an ultracold freezer to store the samples until picked up for transport ($4,800 each) and a tablet for data collection and tracking at each site ($200 each).

Laboratory Testing
Our laboratory request covers three primary types of molecular testing: next-generation sequencing, real-time PCR, and ELISA-based antibody serology. In Y1, we will test 300 existing PREDICT bat and rodent samples, pooled by three, via NGS Ampliseq on LIBR's existing MiSeq machine. We will barcode 5% these, a process that most likely will be done outside of Liberia. In Y2-OY2, we will use a Taqman Array Card system (modified for a 96-well plate to run on LIBR's ABI 7000 sequencer) to test human samples for up to 31 pathogens at three samples per plate, and will run nasopharyngeal samples on singleplex PCR to test for key respiratory pathogens. We will run specific real-time PCR to confirm positives; NGS Ampliseq to further sequence viral-positive human samples (expect not more than 10% to fall into this category) and 10% of negative human samples; and specific antibody ELISAs on convalescent samples from humans who tested positive on TAC plus 20 of their neighbors. For animals in Y2-OY2, we have budgeted for specific antibody ELISAs on all animals, averaging 5 tests each, pooled by 5; NGS on 10% of animal samples pooled by three; singleplex PCR for confirmation of NGS positives (expect ~4%); a new ELISA reader; a new ELISA plate shaker; Mastermix; and miscellaneous consumables. We request $453,414 over the five years of the proposed project. Of this amount, $152,400 is for next-generation sequencing, $4,000 is for barcoding, and the remainder supports the PCR and ELISA testing, which are and will continue to be mainstays of the laboratory.

Meetings and Conferences
We request support for an annual meeting each year for 45 people including personnel from all partner institutions (EHA, NPHIL, SCNL, LCRP, UNMC, GU) as well as local stakeholders. Travel costs for United States-based participants to attend the annual meeting are covered in the EcoHealth Alliance budget. We estimate that for the three-day meeting, eight Liberian partners traveling from outside Monrovia will require transportation, meals and accommodation to be covered, and for Y3, when the annual meeting will function as a broader regional technical

meeting, we will also fund two attendees from elsewhere in West Africa (likely Guinea) working on similar studies. Additionally, the meetings will require a room rental, lunch for all participants, and printing of materials and supplies. Overall costs are estimated at $9,550 p.a.

We will conduct a series of workshops across the study period, as outlined in the technical proposal and in more detail in Attachment 3. *Workshop 1a* will cover the overall research study protocol, will occur at the Y1 kickoff meeting, and will include all project participants. *Workshop 2a* will cover the human study protocol and human subjects research, will occur mid-Y1 and again toward the end of Y3, and will include Tasks 2 and 4 personnel and students. *Workshops 3a and 3b* will cover biosafety, biosecurity, and laboratory techniques training, will occur twice during Y1 (at the kickoff meeting and again in the middle of the year) and during Y3, and will include all Task 3 personnel. *Workshop 4a* will cover the animal sampling protocol and animal subjects research, will occur at the kickoff meeting and during Y3, and will include all Task 4 personnel and students. *Workshop 5a* will cover analysis of laboratory data (including bioinformatics), will occur during Y2 as the laboratories ramp up their sample testing, and will include Task 3 personnel. *Workshop 6a* will cover risk reduction analysis and opportunities, will occur during OY2, and all personnel including many from ministries not directly involved in the project will be invited to attend. Across the workshops, the number of participants will vary from 10-20 people for whom we will require catering (lunch) for all participants, room rental, and some materials and supplies. Over the five proposed years of the project, $12,440 is requested to support these workshop trainings.

Two NPHIL personnel will travel to each of the five study communities for two-day, one-night trips to share study findings with community members and discuss risk reduction opportunities in OY1-2. Lodging, meals, and printed materials and supplies are estimated at $310 per visit.

Freezer Maintenance
Support of $500 p.a is requested to cover the cost of freezer maintenance (the newly-purchased freezer and LIBR's existing freezer) to ensure they are properly maintained, calibrated and in full working order at all times.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 10% on all direct costs.

Reducing the threat from high-risk pathogens causing febrile illness in Liberia

PI: William B. Karesh, EcoHealth Alliance, BTRP-TA.6 CC

HDTRA1-14-24-FRCWMD-BAA WMD GRANT # 12819625

Objective: Work with government and NGO partners in Liberia reduce the threat from high consequence zoonotic pathogens associated with acute febrile illness (AFI) via integrated human-animal pathogen surveillance and diagnostic approach.

Method: Collect clinical samples from febrile patients to investigate etiologies via PCR, next-generation sequencing, and ELISA serology in Liberia. Follow up with interviews to assess human contact with animals and identify evidence of same pathogens in the humans' environments; develop and implement risk reduction interventions.

Status of effort: Collaborative team in place, preliminary data on circulating viral pathogens in key wildlife species and preliminary data on human-animal interface risks collected

Personnel Supported: Liberians--17 Researchers (4 clinical study technicians/nurses, 8 animal field technicians, 4 lab scientists, 1 post-doc), ≥3 Liberian students (undergrad and Masters) per semester educated in field and lab techniques

Publications and Meetings: ~10 presentations in Liberia and globally, >5 peer-review articles are expected to be published

Major Goals and Milestones:

- Study human pathogens in four unique counties to determine causative agent of acute fever (Y1-OY2)
- Undertake field sampling of key animal species and assess transmission risk to humans (Y1-OY2)
- Develop basic and advanced laboratory diagnostic skills and capacity (Y1-OY2)

Funding Profile Y1:995,517 Y2:$989,251 Y3:$996,113 OY1:$962,716 OY2:$969,218

Contact information PI: Dr. William B. Karesh, karesh@ecohealthalliance.org, 212-380-4463

Statement of Work

Project Title: Reducing the threat from high-risk pathogens causing febrile illness in Liberia

Document Date: July 26, 2019

Objective: This project will build Liberian capacity for threat reduction through an integrated human-animal surveillance approach to high consequence zoonotic pathogens associated with human acute febrile illness (AFI) including Ebola virus, Lassa virus, and other emerging infections. We will identify and characterize the etiological agents of infectious AFI in Liberia, particularly among patients with a history of animal contact. Many AFI causative agents may go undetected empirically by common rapid diagnostic tests or by existing surveillance platforms. We will work to mitigate this challenge through scientific discovery, hypothesis testing, and capacity building while leveraging significant U.S. government and other investment in workforce building and laboratory infrastructure. Training provided to local partners in critical biosecurity and biosafety skillsets will include: sample transport and laboratory biosafety and biosecurity; human and animal sampling approaches; performance of both routine and advanced molecular diagnostic assays; cold-chain transport implementation; and data analysis and reporting. As many emerging diseases have been inadequately studied in Liberia, this project will provide fundamental baseline knowledge of pathogens circulating and potentially causing human illness. Its outcomes will suggest opportunities for improved clinical training, tailored case definitions, and other methods to improve identification rates for especially dangerous pathogens at the index case level and prior to widespread transmission. The desired endpoint is a broad, sustainable surveillance program that enhances public and global health security.

Scope: The grantee proposes a five-year multi-disciplinary study incorporating the epidemiology, ecology, and microbiology of AFI in Liberia. The grantee team shall focus on the following major **goals** and milestones:

1. **Identify causative agents of AFI in Liberia**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Enroll human patients and undertake sampling (Y1-3 & OY1-2)
    - Undertake sample processing and testing (Y1-3 & OY1-2)
2. **Identify evidence for zoonotic transmission of high-consequence AFI pathogens**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Undertake sample processing and testing (Y1-3 & OY1-2)
    - Undertake preliminary animal sampling (Y1)
    - Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2)
    - Analyze data (Y2-3 & OY1-2)
3. **Identify risk factors for zoonotic AFI in humans**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Undertake preliminary animal sampling (Y1)
    - Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2)

- Analyze data (Y2-3 & OY1-2)
- Disseminate information to stakeholders (Y2-3 & OY1-2)

Background: Limited detection and diagnostic capacity by definition results in a limited ability of clinicians and public health professionals to accurately identify infectious agents. Febrile illness can be caused by pathogens other than malaria and typhoid that may include dozens of pathogens unassessed by health providers, including hemorrhagic fever viruses; bacterial Select Agents such as *Burkholderia mallei/pseudomallei, Yersinia pestis, and Coxiella burnetti;* and any number of as-yet unknown pathogens. Because the incidence of such agents has not been assessed in Liberia, febrile illness thus presents an unquantified and undifferentiated burden to Liberian health and the health care system and continues to do so. Liberia's public health authorities do not assess incidence of febrile illness. Some studies are just beginning to assess this. Other published studies have reported on causative agents of infectious fever in other low- and middle-income countries (LMIC), including in West Africa. In low resource settings, and particularly where malaria is endemic, patients presenting with febrile illness may be treated presumptively for malaria and may not receive an accurate diagnosis. Co-infections may also be common, particularly with malaria parasites. Where studies have sought to investigate the source of febrile illness, high-risk pathogens of proliferation concern such as *Brucella*, dengue virus, and viral hemorrhagic fevers have been observed. The specific challenge for Liberian health authorities is that pathogens that result in a burden of febrile illness in the population—and the zoonotic transmission pathways that may drive it have not been systematically nor comprehensively identified.

Preliminary Data: This project will leverage more than four years of human and animal data collected during the USAID PREDICT Ebola Host Project in Liberia and in neighboring countries. To date, our team in Liberia has enrolled 585 people and sampled 5387 wild and domestic animals. That project has focused on determining the animal reservoir of Zaire ebolavirus and human behavior/activities to evaluate risk factors for spillover to people. Our research team, which included U.S. and Liberian partners, made the first discovery of the virus in a bat in West Africa. Partner discoveries have included a virus new to science, Bombali ebolavirus, in a bat in Sierra Leone. Anthropological investigation of the risk factors associated with zoonotic spillover events were also extensively addressed; data are still being collated and analyzed, but preliminary evaluation reveals trends in animal contact that vary by country, gender, age, and occupation. The data suggest that in the general Liberian population, some communities are nearly evenly split (up to 60%/40%) with members that have and do not have animal contact as defined by the survey; this informs our own study design in that it provides a sound statistical basis testing the questions at the root of our hypotheses, including whether animal contact is a risk factor for certain zoonotic febrile infections.

Most of the work of the Ebola Host Project is presently being prepared for publication. Key references available include:

- EcoHealth Alliance. 2019. *EcoHealth Alliance Scientists Discover the Deadly Zaire Ebola Virus in West African Bat* [press release]. Retrieved from: https://www.ecohealthalliance.org/2019/01/ecohealth-alliance-scientists-discover-the-deadly-zaire-ebola-virus-in-west-african-bat.
- Goldstein T, Anthony SJ, Gbakima A, et al. The discovery of Bombali virus adds further support for bats as hosts of ebolaviruses. *Nat Microbiol* 2018;3:1084-1089.

Tasks/Scientific Goals: **(Format: Year #(s).Task #. Sub-task#)**

TASK 1

1.1: Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia

The grantee shall oversee refinement and finalization of human and animal study protocols and data collection instruments. This stage incorporates planning and training in the protection of human subjects and animal subjects; training in laboratory biosafety, biosecurity, and safe disposal of samples or sampling materials after laboratory work (which will adhere to guidelines in the BMBL 5th edition, sections III – VI[25]); laboratory diagnostic techniques; and any necessary revisions to original sampling and testing approach based on DTRA feedback and discussion at the kick-off meeting. We will refine our human subjects data collection tools, piloting our instruments within our research network to assure validity and reliability of the questionnaires. A database will be created for secure data entry and data storage of human subjects data. MOH will assign personnel to train clinical staff and oversee study in clinics in Monrovia and Bong. NPHIL and CVL will assign personnel to laboratory. EHA and Liberian partners will host kick-off meeting in Monrovia, Liberia to which all partners will be invited. Each study partner will present on its roles and specific desired outcomes to support its agency's priorities. In addition, we will invite other researchers undertaking febrile illness and related research in-country, such as the U.S. Centers for Disease Control and Prevention (AFI study), the Walter Reed Army Institute of Research (Joint West Africa Research Group), and the Henry Jackson Foundation (sepsis study). Human subjects research and lab training workshops will occur during kick-off.

1.1.1 Refine and finalize human and animal study protocols and data collection instruments
1.1.2 Secure and finalize all research permits (human and animal) including IRB, IACUC, and national approvals in Liberia
1.1.3 Assign MOH, NPHIL, and CVL staff to field and laboratory positions
1.1.4 Host kick-off meeting in Liberia
1.1.5 Conduct Workshop 1a: overall research protocol (concurrent with Task 1.1.4)

TASK 2

1.2 – O2.2: Enroll human patients and undertake sampling

We will enroll febrile patients at two hospitals in Y1-3 and two hospitals in Y4-5 to collect blood and respiratory samples and transport them to the Liberia Institute for Biomedical Research (LIBR) for testing. Cross-sectional sampling will be used to provide a representative sample of a relatively urban or relatively rural population (depending on site) of individuals with fever. Longitudinal sampling of target populations (not individuals) across up to 2.5 years per clinical study site will maximize the opportunity for detection and possibly reveal seasonal trends in infection or other time-related changes in trends. Sampling will be based on available volume in the clinical sites but is designed to assure detection of rare pathogens and answering questions about the relative proportion of febrile illness caused by each; we are targeting 1,500 patients at the first two hospitals total, and 1,500 at the second set of sites in the option years. We will review historical and concurrent surveillance reports for the study counties and for neighboring counties as comparators. MOH will provide a locally hired on-site project coordinator to work with the hospital team and oversee the study protocol (train clinicians and nurses; be alerted when febrile patients arrive; work with hospital staff to oversee informed consent, enrollment, sample collection, and interviews). will train study staff in human subjects research and patient

recruitment; biosafety, safe and secure sample collection, handling, packaging, and transport; and implementation of the study protocol. Training will provide the principles for safe and ethical human subjects research; and project-specific teachings to ensure staff understand, practice, and can implement the study protocol (enrollment determination, informed consent, and questionnaire administration (demographic information, animal ownership), sample acquisition, data entry, and sample packaging and readying for transport).

1.2.1, 3.2.1 Conduct Workshop 2a: IRB/human subjects research
1.2.2-O2.2.2 Locally-hired project coordinator reports to hospital at each study site
1.2.3-O2.2.3 Enroll patients (continuous)

TASK 3

1.3 – O2.3: Undertake sample processing and testing

LIBR reception personnel will be briefed on the study protocol and will notify the project supervisor on receipt of the samples, at which point study-specific inventory and storage procedures will be followed. LIBR has an ABI 7000 Sequence Detection System in operation on which the laboratory scientists and technicians are well trained; a MiSeq system for NGS that is available but requires staff training; and ELISA platforms for serology. NPHIL will budget for and be responsible for ordering needed consumables throughout the project, and UNMC will provide assistance, training, and oversight. LIBR staff are already trained in real-time PCR and ELISA platforms; UNMC will refresh these skills and provide additional training via two one-week didactic and hands-on workshops Y1; another dedicated workshop in Y3; and in other years if needed via visits to the laboratory. These will cover execution of specific pathogen tests, advanced techniques (NGS), and results interpretation (including NGS bioinformatics); sample inventory management; and biorisk management. UNMC will provide oversight and mentorship through their at least twice-yearly working visits to Monrovia and the laboratory as well as video and teleconference. UNMC will leverage its additional DTRA work at LIBR (under funding consideration) to assist with skill-building among laboratory scientists and technicians there. UNMC will assess competence at each visit via a standardized evaluation form to use as a basis for targeted future training.

1.3.1-O2.3.1 Provide necessary equipment and consumables to NPHIL laboratory (continuous)
1.3.2, 3.3.2 Conduct Workshop 3a: laboratory biosafety and biosecurity, sample disposition
1.3.3, 3.3.3 Conduct Workshop 3b: laboratory sample testing techniques
1.3.4-O2.3.4 Provide continuous on-the-job training in laboratory techniques
1.3.5 Submit annual report (Y1)
2.3.6 Host workshop on results interpretation/bioinformatics
3.3.7 Host regional technical ad networking workshop

TASK 4

1.4 – 3.4 Undertake preliminary animal sampling

While laboratory training is beginning, preliminary field animal sampling will begin in Y1 with sampling in communities selected based on previous cases of AFI from historical hospital admissions trends, including some communities from which the study site hospitals draw patients. We will review a sampling of hospital records from Monrovia and Bong in search of geographic trends in AFI presentations going back three years, and begin randomized sampling

of peridomestic and wild animals in four communities identified as part of this process and continue every three months. In five-day/five-night trips we will target approximately 50 bats, 50 rodents, 50 livestock (including chickens if poultry-transmitted infection is suspected), and 10 dogs per sampling event, allowing for approximately 640 animals sampled in Y1 to include blood and oral/nasopharyngeal specimens, and feces and urine when possible. Our teams are trained in species identification, and we will also plan to barcode approximately 5% of individual bats and rodents in Y1 to improve species determination and team training. All animals will be non-lethally sampled with strict adherence to U.S. IACUC-approved protocols following those currently used by EHA scientists globally (Attachment 3) and using bat and rodent sampling protocols we developed for the PREDICT project (Attachment 3). All personnel undertaking animal sampling will be will be trained to ensure competency with a combination of didactic and practical training. SCNL will transfer samples to LIBR consistent with PREDICT protocols (Attachment 3).

1.4.1, 3.4.1 Conduct Workshop 4b: IRB/human subjects research (for animal teams)

1.4.2 Review hospital records in search of geographic trends in acute febrile illness presentations

1.4.3 Sample in communities identified as part of this process and continue every three months

TASK 5

1.5 – O2.5: Visit communities: human-animal interface assessment, animal sampling, and human serology

Animal sampling will continue in Y2, expanding to communities of enrolled patients, sampling in and around study enrollees' homes and surrounding areas; we plan to reach three communities in Y2. This task predominantly supports Hypothesis 3. It is designed to: a) assess the risk interface between people and animals; b) strategically target and sample animal species for the pathogens/antibodies they are most likely to have based on what is already known about pathogen-host proclivity; and c) enable follow-up serology on patients and their community neighbors. We will sample five communities in the catchment areas of Redemption and Phebe Hospital, targeting 400 animals per community, and the patient plus 20 neighbors per community for human interviews and blood sampling. In option years, we will target three communities with the same numbers of animal and human subjects per community.

2.5.1-O2.5.2 Review study patient records for geographic trends in AFI presentations

2.5.2-O2.5.3 Undertake sampling in and around study enrollees' homes

2.5.3-O2.5.4 Undertake sampling from broader patients' communities

2.5.4-O2.5.5 Administer human-animal interface assessment

2.5.5-O2.5.6 Collect human samples for serology

TASK6

2.6 – O2.6: Analyze data

We will compare any diagnoses established at the clinical sites to laboratory results; and compare clinical study site diagnoses and laboratory results to national weekly and monthly county surveillance records. We will estimate population in catchment areas (from where the patient population comes) to develop prevalence estimates of each detected pathogen. We will compare phylogenetic sequence data from humans and animals to identify possible shared strains and infer transmission. Using the questionnaire data comparisons of exposure variables across

varying demographics measures in study sites will be conducted to characterize high risk behaviors and statistical analysis will be employed to identify differences between groups with a 95% probability of detecting a difference. As appropriate, multivariate analysis will be utilized to evaluate the relationship between the positive biological findings and key measures of contact to evaluate the factors that influence and may have led to AFI pathogen exposure. The pathogen and human interface data collected in this study; characterization of zoonotic potential through phylogenetic analyses undertaken in this and other studies (such as PREDICT); and additional data such as available spatial, ecological, and environmental data will inform models designed to help tease correlation from causation. The data will thus provide the foundation of an OY2 risk reduction workshop. We will also compare diagnostic results for endemic agents to reports for these diagnoses in the preceding years to allow for control for any changed practices (even if subconscious) in our target counties based on the project team's presence; this will also allow for a controlled comparison of the impact on incidence of any differential diagnosis or testing interventions we may implement in OY1 and OY2. We will develop recommendations for adapted differential diagnostic protocols and testing practices.

2.6.1-O2.6.1 Undertake data analysis

TASK 7

2.7-O2.7: Disseminate information to stakeholders

We will host the annual stakeholders meeting to which we will invite all project partners as well as others doing related research in country. We will discuss preliminary data and analyses and use these to inform any needed modifications to forward sampling strategy. We will review protocols for biosafety, specimen transport, and animal handling at each annual meeting. We will provide support travel for at least one (1) Liberian scientist to present at an international conference. We will share samples as appropriate with other in-country projects to ensure synergies. We will compile and summarize research results and share with all partners and other in-country researchers as appropriate and use it to develop an annual report for DTRA. In Y3, we will broaden annual stakeholders meeting to include regional partners from Guinea and possibly other adjacent countries; share information about ongoing research; plan cross-border study for OY1. We will broaden outreach in Y3 and OY2 to communities that have engaged in sampling to share results and discuss preliminary risk mitigation strategies. Project data will provide the foundation of an OY2 risk reduction workshop at the annual meeting to engage multi-sectoral Liberian participants to review statistical evaluation of diagnostic data, identify key risk interfaces, assess economic options for prevention and control, and develop threat reduction measures. Workshop products include 1) development of priorities for refined PCR and serological tests based on study findings, 2) recommendations for an updated national surveillance and reporting strategy and plan, 3) inclusion of stakeholders (e.g., National Disaster Management Authority, the Forestry Development Authority, the Ministry of Finance) to consider options for risk and impact reduction and generate policy recommendations. We will work with MOH and MOA to develop written educational products designed for laypersons to explain project results, community impact, and risk mitigation, and thank community members for their participation.

2.7.1-O2.7.1 Host annual stakeholders meeting

2.7.2-O2.7.2 Present to DTRA at Annual Technical Review

2.7.3-O2.7.3 Submit annual report

2.7.4-O2.7.4 Share specimens if available and appropriate with other in-country researchers

2.7.5, O2.7.5 Support Liberian scientist to present at international conference
3.7.6 Host regional technical and networking workshop
3.7.7-O2.7.7 Prepare/submit up to two (2) peer-reviewed manuscripts
3.7.8, O2.7.8 Engage sampled communities for follow-up education
O2.7.9 Conduct Workshop 6a: risk reduction workshop

Cost estimate: Y1: $995,517.56 Y2: S989,251.55 Y3: S996,113.74 OY1: $962,716.26
OY2: S969,218.86

Performance Schedule:

Task	Y1	Y2	Y3	OY1	OY2
Task 1: Establish evidence-based research initiative for high-consequence pathogens in Liberia					
1.1 Refine and finalize human and animal study protocols					
1.2 Secure and finalize all research permits (human and animal)					
1.3 Assign MOH, NPHIL, and CVL staff to field and lab positions					
1.4 Host kick-off meeting in Liberia					
1.5 Conduct Workshop 1a: overall research protocol					
Task 2: Enroll human patients and undertake sampling					
2.1 Conduct Workshop 2a: IRB/human subjects research					
2.2 Local project coordinator reports to hospital at each study site					
2.3 Enroll patients (continuous)					
Task 3: Undertake sample processing and testing					
3.1 Provide equipment and consumables to LIBR					
3.2 Conduct Workshop 3a: biosafety/biosecurity, sample disp.					
3.3 Conduct Workshop 3b: laboratory sample testing techniques					
3.4 Provide on-the-job training in lab techniques (continuous)					
3.5 Submit Y1 annual report					
3.6 Conduct Workshop 5a: results interpretation, bioinformatics					
3.7 Host regional technical and networking workshop					
Task 4: Preliminary animal sampling					
4.1 Conduct Workshop 4a: IACUC/animal subjects research					
4.2 Review hospital records for geo. trends in AFI presentations					
4.3 Sample animals in select communities (preliminary)					
Task 5: Visit communities: interface assessment, animal sampling, human serology					
5.1 Review study patient records for geographic AFI trends					
5.2 Administer human-animal interface assessment					
5.3 Undertake animal sampling in/around study enrollees' homes					
5.4 Undertake animal sampling from patients' communities					
5.5 Collect human samples for serology					
Task 6: Analyze data					
6.1 Undertake data analysis					
Task 7: Disseminate research results to stakeholders					
7.1 Host annual Stakeholders meeting					
7.2 Present to DTRA at Annual Technical Review					
7.3 Submit annual report					
7.4 Share specimens if appropriate w/ other in-country researchers					
7.5 Support Liberian scientist to international conference					
7.6 Host regional technical and networking workshop					
7.7 Prepare/submit up to two (2) peer-reviewed manuscripts					
7.8 Engage sampled communities for follow-up education					
7.9 Conduct Workshop 6a: risk reduction workshop					

OMB Number: 4040-0001
Expiration Date: 10/31/2019

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION
☐ Pre-application ☒ Application ☐ Changed/Corrected Application

2. DATE SUBMITTED | **Applicant Identifier**

4. a. Federal Identifier

b. Agency Routing Identifier GRANT12819625

c. Previous Grants.gov Tracking ID

5. APPLICANT INFORMATION

Organizational DUNS: 077090660000

Legal Name: EcoHealth Alliance
Department:
Division:
Street1: 460 W 34th St
Street2: 17th Floor
City: New York
County / Parish: NY
State: NY: New York
Province:
Country: USA: UNITED STATES
ZIP / Postal Code: 10001-2320

Person to be contacted on matters involving this application

Prefix: Dr.
First Name: Ellen
Middle Name:
Last Name: Carlin
Suffix:
Position/Title: Senior Health and Policy Specialist
Street1: 460 W 34th St
Street2: 17th Floor
City: New York
County / Parish: NY
State: NY: New York
Province:
Country: USA: UNITED STATES
ZIP / Postal Code: 10001-2320
Phone Number: 202-633-4997
Fax Number: 212-380-4465
Email: carlin@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION *(EIN) or (TIN)*: 311726494

7. TYPE OF APPLICANT: M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)
Other (Specify):
Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION:
☒ New ☐ Resubmission
☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).
☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration
☐ E. Other (specify):

Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. NAME OF FEDERAL AGENCY: Defense Threat Reduction Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 12.351
TITLE: Scientific Research: Combating Weapons of Mass Destruction

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Reducing the threat from high-risk pathogens causing febrile illness in Liberia

12. PROPOSED PROJECT:
Start Date: 01/01/2020
Ending Date: 12/31/2024

13. CONGRESSIONAL DISTRICT OF APPLICANT
NY-010

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name: William Middle Name:
Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy
Organization Name: Ecohealth Alliance
Department: Division:
Street1: 460 W 34th St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4463 Fax Number: 212-380-4465
Email: karesh@ecohealthalliance.org

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	4,912,818.06
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	4,912,818.06
d. Estimated Program Income	0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR
☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ **I agree**

**The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL (Disclosure of Lobbying Activities) or other Explanatory Documentation

Add Attachment

19. Authorized Representative

Prefix: Dr. First Name: Aleksei Middle Name:
Last Name: Chmura Suffix:
Position/Title: Authorized Organizational Representative
Organization: Ecohealth Alliance
Department: Division:
Street1: 460 W 34th St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4473 Fax Number: 212-380-4469
Email: chmura@ecohealthalliance.org

Signature of Authorized Representative: Aleksei Chmura

Date Signed: 07/26/2019

20. Pre-application Add Attachment

21. Cover Letter Attachment 1234-DTRA Liberia cover letter.pdf Delete Attachment View Attachment

RESEARCH & RELATED Other Project Information

OMB Number: 4040-0001
Expiration Date: 10/31/2019

1. Are Human Subjects Involved? ☒ Yes ☐ No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

If no, is the IRB review Pending? ☐ Yes ☒ No

IRB Approval Date: 01/06/2020

Human Subject Assurance Number:

2. Are Vertebrate Animals Used? ☒ Yes ☐ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☐ Yes ☒ No

IACUC Approval Date: 01/06/2020

Animal Welfare Assurance Number: A4059

3. Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. Does this Project Have an Actual or Potential Impact - positive or negative - on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. Does this project involve activities outside of the United States or partnerships with international collaborators? ☒ Yes ☐ No

6.a. If yes, identify countries: Liberia

6.b. Optional Explanation:

7. Project Summary/Abstract 1235-DTRA Liberia 2019 Project Summar | Delete Attachment | View Attachment

8. Project Narrative 1236-DTRA Liberia 2019 Project Narrat | Delete Attachment | View Attachment

9. Bibliography & References Cited 1237-DTRA Liberia 2019 References PIN | Delete Attachment | View Attachment

10. Facilities & Other Resources 1238 Facilities Description.pdf | Delete Attachment | View Attachment

11. Equipment | Add Attachment

12. Other Attachments Add Attachments

OMB Number: 4040-0001
Expiration Date: 10/31/2019

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Dr. * First Name: William Middle Name:
* Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 212 380 4463 Fax Number: 212 380 4465
* E-Mail: karesh@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** PD/PI **Other Project Role Category:**

Degree Type: DVM
Degree Year: 1982

***Attach Biographical Sketch**	1240-Karesh_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1241-Karesh C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 1

Prefix: Dr. * First Name: Ellen Middle Name:
* Last Name: Carlin Suffix:
Position/Title: Senior Health and Policy Specialist Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 202 633 4997 Fax Number: 212 380 4465
* E-Mail: carlin@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: DVM
Degree Year: 2007

Attach Biographical Sketch	1242-Carlin_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1243-Carlin_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 2

Prefix: Dr. * First Name: Jonathan Middle Name:

* Last Name: Epstein Suffix:

Position/Title: Vice President for Science and Outreach Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320

* Phone Number: 212 380 4467 Fax Number: 212 380 4465

* E-Mail: epstein@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2017

Attach Biographical Sketch	1244-Epstein BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1245-Epstein_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 3

Prefix: Dr. * First Name: Moscka Middle Name:

* Last Name: Fallah Suffix:

Position/Title: Deputy Director General Department:

Organization Name: National Public Health Institute of Liberia Division:

* Street1: Congo Town Back Rd

Street2:

* City: Monrovia County/ Parish:

* State: Province:

* Country: LBR: LIBERIA * Zip / Postal Code:

* Phone Number: +231886553011 Fax Number:

* E-Mail: mfallah1969@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PHD

Degree Year: 2011

Attach Biographical Sketch	1246 Fallah_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1247 Fallah_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 4

Prefix: Dr. * First Name: Noam Middle Name:

* Last Name: Ross Suffix:

Position/Title: Senior Research Scientist, Modeler Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320

* Phone Number: 212 380 4471 Fax Number: 212 380 4465

* E-Mail: ross@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Senior Research Scientist, Modeler

Degree Type: PhD

Degree Year: 2015

Attach Biographical Sketch	1248-Ross_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1249-Ross_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 5

Prefix: Dr. * First Name: Claire Middle Name:

* Last Name: Standley Suffix:

Position/Title: Assistant Research Professor Department: Center for Global Health Scien

Organization Name: Georgetown University Division:

* Street1: 3900 Reservoir Road, N.W.

Street2:

* City: Washington County/ Parish:

* State: DC: District of Columbia Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 20007 2194

* Phone Number: 202-290-0451 Fax Number:

* E-Mail: claire.standley@georgetown.edu

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2011

Attach Biographical Sketch	1250 Standley_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1251 Standley_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 6

Prefix: Ms. * First Name: Catherine Middle Name:

* Last Name: Machalaba Suffix:

Position/Title: Policy Advisor and Research Scientist Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320

* Phone Number: 212 380 4472 Fax Number: 212 380 4465

* E-Mail: machalaba@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Policy Advisor and Research Scientist

Degree Type: MPH

Degree Year: 2009

Attach Biographical Sketch	1252-Machalaba_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1253-Machalaba_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 7

Prefix: Dr. * First Name: Michael Middle Name:

* Last Name: Wiley Suffix:

Position/Title: Assistant Professor Department: College of Public Health

Organization Name: University of Nebraska Medical Center Division:

* Street1: 4400 Emile St

Street2:

* City: Omaha County/ Parish:

* State: NE: Nebraska Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 68198 0600

* Phone Number: 215-870-0731 Fax Number:

* E-Mail: mike.wiley@unmc.edu

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PHD

Degree Year: 2012

Attach Biographical Sketch	1254 Wiley_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1255 Wiley_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 8

Prefix: Ms. * First Name: Emily Middle Name:

* Last Name: Hagan Suffix:

Position/Title: Behavioral Risk Program Manager Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320

* Phone Number: 212 380 4491 Fax Number: 212 380 4465

* E-Mail: hagan@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Behavioral Risk Scientist

Degree Type: MPH

Degree Year: 2013

Attach Biographical Sketch	1256-Hagan_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1257-Hagan_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 9

Prefix: Dr. * First Name: James Middle Name:

* Last Name: Desmond Suffix:

Position/Title: Department:

Organization Name: Liberia Chimpanzee Rescue and Protection Division:

* Street1: Congo Town Back Rd

Street2:

* City: Monrovia County/ Parish:

* State: Province:

* Country: LBR: LIBERIA * Zip / Postal Code:

* Phone Number: + 231776147565 Fax Number:

* E-Mail: jdesmo01@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: DVM

Degree Year: 2008

Attach Biographical Sketch	1258 Desmond_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1259 Desmond_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 10

Prefix: Dr. * First Name: Anne Middle Name:

* Last Name: Laudisoit Suffix: Ph.D.

Position/Title: Senior Scientist Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320

* Phone Number: 6468684715 Fax Number:

* E-Mail: Laudisoit@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Senior Scientist

Degree Type:

Degree Year:

Attach Biographical Sketch	1260-Laudisoit_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1261-Anne Laudisoit_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 11

Prefix: Dr. * First Name: Erin Middle Name:

* Last Name: Sorrell Suffix: Ph.D.

Position/Title: Department: Microbiology and Immunology

Organization Name: Georgetown University Division:

* Street1: 3900 Reservoir Rd, N.W.

Street2:

* City: Washington D.C. County/ Parish:

* State: DC: District of Columbia Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 20007 2194

* Phone Number: 2026878392 Fax Number:

* E-Mail: Erin.Sorrell@georgetown.edu

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2009

Attach Biographical Sketch	1262 Sorrell_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1263 Sorrell C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 12

Prefix: Dr. * First Name: Faterma Middle Name:

* Last Name: Bolay Suffix: Ph.D.

Position/Title: Director, Public Health & Med. Res Department:

Organization Name: National Public Health Institute of Liberia Division:

* Street1: Congo Town Back Rd

Street2:

* City: Monrovia County/ Parish:

* State: Province:

* Country: LBR: LIBERIA * Zip / Postal Code:

* Phone Number: +231886553011 Fax Number:

* E-Mail: director.libr@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 1989

Attach Biographical Sketch	1264-Bolay BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1265-Bolay_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 13

Prefix: * First Name: Bode Middle Name:

* Last Name: Shobayo Suffix:

Position/Title: Deputy Director Department:

Organization Name: National Public Health Institute of Liberia Division:

* Street1: Congo Town Back Rd

Street2:

* City: Monrovia County/ Parish:

* State: Province:

* Country: LBR: LIBERIA * Zip / Postal Code:

* Phone Number: +231886553011 Fax Number:

* E-Mail: odeshobayo@gmail.com

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Senior Research Scientist

Degree Type: M.S

Degree Year: 2014

Attach Biographical Sketch	1266 Shobayo BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1267 Shobayo_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 14

Prefix: | * First Name: John | Middle Name:

* Last Name: Dogba | Suffix:

Position/Title: Director, National Public Health Reference La | Department:

Organization Name: National Public Health Institute of Liberia | Division:

* Street1: Congo Town Back Rd

Street2:

* City: Monrovia | County/ Parish:

* State: | Province:

* Country: LBR: LIBERIA | * Zip / Postal Code:

* Phone Number: +231886553011 | Fax Number:

* E-Mail: dogba484@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: MPH

Degree Year: 2010

Attach Biographical Sketch	1268-Dogba BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1269-Dogba_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 15

Prefix: Dr. | * First Name: Michael | Middle Name:

* Last Name: Garbo | Suffix:

Position/Title: Executive Director | Department:

Organization Name: Society for the Conservation of Nature of Liberia | Division:

* Street1: Tubman Blvd

Street2:

* City: Monrovia | County/ Parish:

* State: | Province:

* Country: LBR: LIBERIA | * Zip / Postal Code:

* Phone Number: +231886553011 | Fax Number:

* E-Mail: scnliberia@yahoo.com

Credential, e.g., agency login:

*** Project Role:** Co Investigator | **Other Project Role Category:**

Degree Type: MS

Degree Year: 2018

Attach Biographical Sketch	1270 Garbo_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1271 Garbo_C&P.pdf		Delete Attachment	View Attachment

William B. Karesh
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: karesh@ecohealthalliance.org

Professional Preparation

Clemson University	Biology	BS	1977
Univ. of Georgia	Veterinary Medicine	DVM	1982
Zool. Society of San Diego	Residency – Wildlife Health		1982 -1984

Appointments

Life Member, Council on Foreign Relations	2016 - present
Emerging Pandemic Threats Partner Liaison, USAID EPT PREDICT-2	2014 - present
Advisor, WHO Expert Panel on MERS-CoV	2013 - present
Expert, WHO International Health Regulation Roster of Experts	2013 - present
Executive Vice President for Health & Policy, EcoHealth Alliance	2010 - present
President, Working Group on Wildlife Diseases, OIE, France	2008 - present
Co-Chair, Wildlife Health Specialist Group, IUCN, Switzerland	2001 - present
Chief Technical Officer, USAID EPT PREDICT	2009 - 2014
Chief of Party, USAID Global Avian Influenza Network for Surveillance	2006 - 2009
Vice President & Director, Global Health Programs, Wildlife Cons. Society	2001 - 2010

Publications

Leroy EM, Rouquet P, Formenty P, Souquiere S, Kilbourn A, Froment JM, Bermejo M, Smit S, Karesh WB, Swanepoel R, Zaki SR, Rollin PE. (2004) Multiple Ebola virus transmission events and rapid decline of central African wildlife. **Science** 303:387-390.

Karesh WB, Reed P. (2005) Ebola and Great Apes in Central Africa: Current Status and Future Needs, **Societe de Pathologie Exotique Bulletin** 98:237-238.

Rouquet P, Froment JM, Bermejo M, Kilbourn A, Karesh WB, Reed P, Kumulungui B, Yaba P, Deilcat A, Rollin PE, Leroy EM. (2005). Wild Animal Mortality Monitoring and Human Ebola Outbreaks, Gabon and Republic of Congo, 2001-2003. **Emerging Infectious Diseases** 11:283-290.

Karesh WB, Dobson A, Lloyd-Smith J, Lubroth J, Dixon MA, Bennett M, Aldrich S, Harrington T, Formenty P, Loh L, Machalaba CC, Thomas MJ, Heymann DL. (2012) The ecology of zoonoses: Their natural and unnatural histories. **The Lancet** 380:1936-1945.

Cameron KN, Reed P, Morgan DB, Ondzié Al, Sanz CM, Kühl HS, Olson SH, Leroy E, Karesh WB, Mundry R. (2016). Spatial and Temporal Dynamics of a Mortality Event among Central African Great Apes. **PLoS ONE** 11(5):e0154505.

Morse SS, Mazet JAK, Woolhouse M, Parrish CR, Carroll D, Karesh WB, *Zambrana-Torrelio C*, Lipkin WI, Daszak P. (2012) Prediction and prevention of the next pandemic zoonosis. **The Lancet** 380:1956-1965.

Karesh WB. (2008) Wildlife health as an indicator of climate change. Institute of Medicine, Global Climate Change and Extreme Weather Events: Understanding the Contributions to Infectious Disease Emergence: Workshop Summary. Washington, DC: **The National Academies Press** 2008:192-213.

Karesh WB and Cook RA. (2005) The human-animal link, One World-One Health. **Foreign Affairs** 84:38-50.

Wolfe ND, Kilbourn AM, Rahman HA, Bosi EJ, Cropp BC, Andau M, Karesh WB, Spielman, A, Gubler, DJ. (2001) Sylvatic transmission of arboviruses among Bornean orangutans. **American Journal of Tropical Medicine and Hygiene** 64:310-316.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: United States, Liberia

Person-Months Per Year Committed to the Cal: 1.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding the Risk of Bat-Bourne Zoonotic Disease Emergence in Western Asia

Source of Support: DTRA

Total Award Amount: $4,391,443.65 Total Award Period Covered: 10/02/2017-10/01/2022

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Ground Truth Network

Source of Support: DHS

Total Award Amount: $2,231,114.13 Total Award Period Covered: 09/30/2016-09/29/2021

Location of Project: United States

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

READY: Augmenting Capacity for Humanitarian Emergencies of Infectious Diseases with Epidemic or Pandemic Potential

Source of Support: USAID

Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018-09/30/2021

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 4.56 Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/01/2019-07/31/2024
Location of Project: United States, Tanzania
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,988,526.00 Total Award Period Covered: 06/01/2019-05/31/2024
Location of Project: United States, South Africa
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH
Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/25
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Michael F Garbo
Society for the Conservation of Nature of Liberia, Tubman Blvd, Monrovia, Liberia
E-mail: scnlliberia@yahoo.com

Professional Preparation

University of Liberia	General Forestry	B.S.	2008
University of Liberia	Regional Planning	M.S.	2018

Appointments

Executive Director, Society for the Conservation of Nature of Liberia	2011 - present
Project Manager, SCNL, Gola Forest National Park in Liberia	2013 - present
Consultant, Establishment of the Grebo-Krahn National Park, Liberia	2016 - present

Publications

Fatorma K. Bolay
National Public Health Institute of Liberia, Congo Town Back Rd., Monrovia, Liberia
E- mail: director.libr@gmail.com

Professional Preparation

Cuttington University	General Sciences	B.S.	1975
University of Bridgeport	Parasitology	M.S.	1980
Johns Hopkins University	Immuno. and Infect. Dis	PhD	1989

Appointments

Director, Public Health & Med. Res., National Public Health Inst. of Liberia	2016 - present
Chairman, National Research Ethics Board	2009 - present
Director, Liberia Institute for Biomedical Research	2006 - 2016
Medical Consultant, WHO Liberia	1997
Member, WHO Expert Committee on Malaria and Trop. Dis. Control	1996
Emergency Health Ops. Coordinator, WHO Liberia	1992 - 1993
Disease Prevention and Control Officer, WHO Country Team, Liberia	1991 - 1996
Deputy Research Coordinator, Liberian Institute for Biomedical Research	1989 - 1991
Chief Medical Entomologist, Liberian Institute for Biomedical Research	1989 - 1991
Scientist, Newborn Screen. Lab, Dept. of Health and Med. Hygiene	1989
Teaching Assistant, Dept of Immuo and Infect. Dis., Johns Hopkins Uni.	1988 - 1989
Medical Entomologist, Liberian Institute for Biomedical Research	1986 - 1987

Publications

Grubaugh ND, Sharma S, Krajacich BJ, Fakoli LS, Bolay FK, Diclaro JW, Johnson WE, Ebel GD, Foy BD, Brackney DE, (2015) Xenosurveillance: A novel mosquito-based approach for examining the human-pathogen landscape **PLoS Neglected Tropica Diseases** 9(3)

Bolay FK, Trpis M. Evaluation of Bacillus thuringiensis var isrealensis (Bti) and Tilapia nilotica (fish) against Rice Field Mosquito. **Israel Journal of Entomology Vol XXIII**. 77-82.

Erin M. Sorrell
Center for Global Health Science and Security, Georgetown University, Washington DC, USA
E-mail: Erin.Sorrell@georgetown.edu

Professional Preparation

Cornell University, USA	Animal Science	B.S.	2001
University of Maryland College Park, USA	Animal Science/Virology	MSc	2005
University of Maryland College Park, USA	Animal Science/Virology	PhD	2008

Appointments

Assistant Research Professor, Georgetown University	2016 - present
Professorial Lecturer, The George Washington University	2014 - 2018
Senior Research Scientist, The George Washington University	2014 - 2016
Adjunct Assistant Professor, Georgetown University	2013 - 2016
Senior Analyst, US Department of State	2013 - 2014
AAAS Science and Technology Policy Fellow, US Department of State	2011 - 2013
Postdoctoral Fellowship, Erasmus Medical Center	2010 - 2011
Postdoctoral Fellowship, University of Maryland College Park	2009 - 2010

Publications

Sorrell EM, El Azhari M, Maswdeh N, Kornblet S, *Standley C*, Katz R, Ablan I, Fischer JE (2015) Mapping of Networks to Detect Priority Zoonoses in Jordan. *Frontiers in Public Health* 3:219.

Sorrell EM, Schrauwen EJA, Linster M, De Graaf M, S. Herfst S, Fouchier RAM. (2011) Predicting "Airborne" Influenza Viruses: (Trans-) mission Impossible? **Current Opinions in Virology** 1(6):635-42.

Sorrell EM, Song H, Pena L, Perez DR. (2010) A 27-amino-acid deletion in the neuraminidase stalk supports replication of an avian H2N2 influenza A virus in the respiratory tract of chickens. **Journal of Virology** 84(22):11831-40.

Sorrell EM, Angel MG, Hickman D, Ye J, Pena L, Ramirez-Nieto GC, Kimble B, Araya Y, Perez DR. (2009) Fitness of pandemic H1N1 and seasonal influenza A viruses during co-infection. **PLoS Currents Influenza** 1

Sorrell EM, Wan H, Array Y, Song H, Perez DR. (2009) Minimal molecular constraints for respiratory droplet transmission of an avian-human H9N2 influenza A virus. **Proceedings of the National Academy of Sciences** 106(18):7565-70.

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Sorrell EM, Ramirez-Nieto G, Gomez-Osorio I, Perez DR. (2007) Genesis of pandemic influenza. **Cytogenetic and Genome Research** 2007;117(1-4):394-402.

John Bobo Dogba
National Public Health Institute of Liberia, Congo Town Back Rd., Monrovia, Liberia
E- mail: dogba484@gmail.com

Professional Preparation

Cuttington University	Biology & Chemistry	B.S.	2008
Cuttington University	Public Health	MPH	2010
University of Ibadan	Vet. Pub. Health & Prev. Med.	PhD	*Exp.*

Appointments

Director National Public Health Reference Laboratory	2017 - present
National One Health Technical Advisor Liberia, USAID	2016 - 2017
Consultant, The Ministry of Health, Global Fund Program Coordination Unit	2016
Lab. Senior Tech. Advisor, Management Sci. for Health, USAID/Liberia	2016
Consultant, Nat. Leprosy and TB Control Program, Liberia	2016
Consultant, National AIDS Commission/UNAIDS Liberia	2015
Director, Min. of Health, Diag. and Lab. Srvcs, Global Fund Project, Liberia	2014 - 2016
Quality Manager, Ministry of Health Diagnostics and Laboratory Services	2009 - 2014
Program Manager, Youth Empowerment Services Liberia Inc.	2008 - 2013
Sentinel Site Supervisor Diagnostic, The Mentor Initiative, PMI/USAID	2008 - 2009
Research Laboratory Technician, Cuttington University	2005 - 2008
Laboratory Technician, Benson Hospital	2003 - 2004

Publications

The Laboratory Health System and Its Response To The Ebola Virus Disease (EVD) Outbreak In Liberia. Kennedy SB, Wasunna CL, **Dogba JB,** Sahr P, Eastman CB, Bolay FK, Mason GT, Kieh MWS. African Journal of Laboratory Medicine (AJLM). 2016 Oct;5(3):509.

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Mapping of Mycobacterium tuberculosis cases in post-conflict Liberia, 2008-2012: A descriptive and categorical analysis of age, gender and seasonal pattern. **Dogba JB,** Cadmus SIB, Olugasa BO**.** Afr J Med Med Sci. 2014; 43(supplement 1):117-124.

Bode Ireti Shobayo
National Public Health Institute of Liberia, Congo Town Back Rd., Monrovia, Liberia
E-mail: odeshobayo@gmail.com

Professional Preparation

Fed. Uni. of Agriculture, Nigeria	Microbiology	B.S.	2010
Fed. Uni. of Agriculture, Nigeria	Med. Microbio & Pub. Health	M.S.	2014

Appointments

Deputy Director, National Public Health Institute of Liberia	2017 - present
Research Scientist, National Public Health Institute of Liberia	2017 - present

Publications

Shobayo BI, Chea SKP, Freeman BM, Mawolo J, *Fallah MP*, Nyenswah, Tolbert. G. (2019). Prevalence and Risk Factors of Hepatitis B Infection in Patients (>18) Attended at Seventh-Day Adventist Cooper Hospital, Sinkor, Liberia, Jan. - Dec. 2016. **Open Access Library Journal.** In Press

Olaboopo AO, Shobayo BI, Ogiogwa J, Ojo DA. (2015). Occurrence of Pathogens in Patients with Indwelling Urinary Catheter at Federal Medical Centre, Abeokuta, South-west Nigeria. **Stem cell.** 6(3):6-11.

Shobayo BI, Ojo DA, Agboola DA. (2015). Antibacterial Activity of Pterocarpus osun on Multi–Drug Resistant (MDR) Escherichia coli from Wound Infections in Abeokuta, South – West Nigeria. **Open Access Library Journal**. 2:e1434.

Shobayo BI, Ojo DA, Olaboopo AO, Agboola DA, Omemu AM, Akingbade OA. (2014). Antibacterial activity of Moringa oleifera on Multi-drug resistant isolates from wound infections in Abeokuta, South – West Nigeria. **New York Science Journal**. 7(12):15-19.

Akingbade OA, Damola AB, Shobayo BI, Nwanze JC, Okonko IO. (2014). Multi-Drug Resistant (MDR) Escherichia coli among Children Suffering from Diarrhea Infections in Abeokuta, Ogun State. **Researcher**. 6(8):11-17.

Akingbade OA, Okerentugba PO, Awoderu OB, Shobayo BI. (2014). Prevalence of Samonella sp and Shigella sp among Children with Diarrhoea in Abeokuta, Ogun State, Nigeria. **Academia Arena**. 6(9):13-16.

Ellen P Carlin
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: carlin@ecohealthalliance.org

Professional Preparation

College of Mount Saint Vincent, NY	Biology	B.S.	1999
Cornell University	Veterinary Medicine	D.V.M.	2007

Appointments

Senior Health and Policy Specialist, EcoHealth Alliance	2016 - present
Principal Investigator, Building Resilience to Biothreats policy initiative (EHA)	2017 - 2019
Co-Director/Senior Advisor, Blue Ribbon Study Panel on Biodefense	2014 - present
Courtesy Lecturer, Cornell University College of Veterinary Medicine	2017 - present
Adjunct Research Scientist, Columbia University Earth Institute NCDP	2016 - present
Principal, Carlin Communications	2011 - 2017
Senior Professional Staff, House Committee on Homeland Security	2007 - 2013
Assistant Editor, Cambridge University Press	1999 - 2002

Publications

Standley C, Carlin EP, *Sorrell E*, Barry AM, Bile E, Diakite AS, Keita MS, Koivogui L, Mane S, Martel LD, Katz R. (2019) Assessing health systems in Guinea for prevention and control of priority zoonotic diseases: A One Health approach. **One Health**; (7):100093.

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Carlin EP, Giller N, Katz R. (2016) Estimating the size of the U.S. population at risk of severe adverse events from replicating smallpox vaccine. **Public Health Nursing** 34(3):200-9.

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Paul M, King L, Carlin EP. (2010) Zoonoses of people and their pets: a US perspective on significant pet-associated parasitic diseases. **Trends in Parasitology** 26(4):153-4.

Pathogens in rural and agricultural water and watersheds 2010: state of knowledge and future directions. Grant report (USDA NIFA Contract no. 2009-65102-05842);October 2010. (Editor, co-author)

Bowman DD, Little SE, Lorentzen L, Shields J, Sullivan MP, Carlin EP. (2009) Prevalence and geographic distribution of *Dirofilaria immitis*, *Borrelia burgdorferi*, *Ehrlichia canis*, and *Anaplasma phagocytophilum* in dogs in the United States: Results of a national clinic-based serologic survey. **Veterinary Parasitology** *160*(1-2):138-148.

Carlin EP, Bowman DD, Scarlett JM, Garret J, Lorentzen L. (2006) Prevalence of *Giardia* in symptomatic dogs and cats throughout the United States as determined by the IDEXX SNAP *Giardia* test. **Veterinary Therapeutics: Research in Applied Veterinary Medicine** *7*(3):199-206.

Michael R. Wiley
College of Public Health, University of Nebraska Medical Center, Omaha, NE
E-mail: mike.wiley@unmc.edu

Professional Preparation

Salisbury University, MD	Molecular Biology	B.S.	2006
Virginia Tech, VA	Molecular Virology	Ph.D.	2012
USAMRIID, MD	Pathogen Discovery	Postdoc	2015

Appointments

Research Assistant Professor, University Nebraska Medical Center, USAMRIID	2015 - 2018
Assistant Professor, University Nebraska Medical Center, USAMRIID	2018 - 2019
Assistant Professor, University Nebraska Medical Center	2019 - present

Publications

Cai Y, Yú S, Jangra RK, Postnikova EN, Wada J, Tesh RB, Whelan SPJ, Lauck M, Wiley MR, Finch CL, Radoshitzky SR, O'Connor DH, Palacios G, Chandran K, Chiu CY, Kuhn JH. (2019) Human, nonhuman primate, and bat cells are broadly susceptible to Tibrovirus particle cell entry. **Frontiers in Microbiology** 10:856.

Mbala-Kingebeni P, Pratt CB, Wiley MR, et. al. (2018) Ebola virus disease outbreak in Équateur Province, Democratic Republic of the Congo: A retrospective genomic characterisation. **The Lancet Infectious Diseases** 19(6):641-647.

Mbala-Kingebeni P, Aziza A, Di Paola N, Wiley MR, et. al. (2019) Medical countermeasures during the 2018 Ebola virus disease outbreak in the North Kivu and Ituri Provinces of the Democratic Republic of the Congo: A rapid genomic assessment. **The Lancet Infectious Diseases** 19(6):648-657.

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Espy N, Pérez-Sautu U, Ramírez de Arellano E, Negredo A, Wiley MR, Bavari S, Díaz Menendez M, Paz Sánchez-Seco M, Palacios G. (2018) Ribavirin has a demonstrable effect on Crimean-Congo Hemorrhagic fever viral populations and viral load during patient treatment. **The Journal of Infectious Diseases**

Catherine C. Machalaba
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001, USA
E-mail: machalaba@ecohealthalliance.org

Professional Preparation

Wake Forest University	Biology	B.A.	2008
Dartmouth Medical School	Public Health	M.P.H.	2009
City University of New York	Environ. Health	Ph.D	2014 - present

Appointments

Research Scientist, EcoHealth Alliance	2018 - present
Policy Advisor, EcoHealth Alliance	2017 - present
Chair, Veterinary Public Health Group, American Public Health Association	2016 - present
Project Science Officer/IPO Lead, Future Earth oneHEALTH Project	2013 - present
Program Officer, IUCN SSC Wildlife Health Specialist Group	2010 - present
Program Coordinator for Health and Policy, EcoHealth Alliance	2010 - 2017
Fellow, Veterans Engineering Recourse Center, VA Boston Healthcare System	2009 - 2010
Field Agent and Educator, Vermont Department of Health	2005

Publications

Smith KM, Machalaba C, Seifman R, Feferholtz Y, *Karesh WB*. (2019) Infectious disease and economics: The case for considering multisectoral impacts. **One Health** 7:100080.

Berthe FCJ, Bouley T, *Karesh WB*, Le Gall FG, Machalaba CC, Plante CA, Seifman RM. (2018) Operational framework for strengthening human, animal and environmental public health systems at their interface. Washington, D.C.: World Bank Group.

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Rostal MK, *Ross N*, Machalaba C, Cordel C, Paweska JT, *Karesh WB*. (2018) Benefits of a One Health approach: An example using Rift Valley fever. **One Health** 5:34-36.

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Kelley TR, *Karesh WB*, Kreuder Johnson C, Gilardi KVK, Anthony SJ, Goldstein T, Olson SH, Machalaba C, PREDICT Consortium, Mazet JAK. (2017) One Health proof of concept: Bringing a transdisciplinary approach to surveillance for zoonotic viruses at the human-wild animal interface. **Preventive Veterinary Medicine** 137:112–118.

Machalaba CC, Elwood SE, Forcella S, Smith KM, Hamilton K, Jebara KB, Swayne DE, Webby RJ, Mumford E, Mazet JAK, Gaidet N, Daszak P, *Karesh WB*. (2015) Global avian influenza surveillance in wild birds: A strategy to capture viral diversity. **Emerging Infectious Diseases** 21(4):e141415.

James S Desmond
Liberia Chimpanzee Rescue and Protection, LIBR, Charlesville, Liberia
E-mail: jdesmo01@gmail.com

Professional Preparation

College of the Holy Cross, MA	Chemistry	B.A.	1993
Tufts School of Vet. Med., MA	Biomedical Sciences	M.S.	2008
Tufts School of Vet. Med., MA	Veterinary Medicine	D.V.M.	2008

Appointments

Director, Liberia Chimpanzee Rescue and Protection	2016 - present
Country Coordinator PREDICT Liberia, EcoHealth Alliance	2015 - present
Field Veterinarian, EcoHealth Alliance	2009 - present
Consultant, Smithsonian Institution	2014 - 2016
Consultant, Jane Goodall Institute; Vets without Borders	2011 - 2014

Publications

Ge XY, Yang WH, Pan H, Zhou JH, Han X, Zhu GJ, Desmond JS, Daszak P, Shi ZL, Zhang YZ (2016). Fugong virus, a novel hantavirus harbored by the small oriental vole (*Eothenomys eleusis*) in China. **Virology Journal** 13:27.

Haider N, Rahman MS, Khan SU, Mikolon A, Osmani MG, Gurley ES, Shanta IS, Paul SK, Macfarlane-Berry L, Islam A, Desmond J, *Epstein JH*, Priestly RA, Kersh GJ, Rahman MZ, Daszak P, Luby S, Massung RF, Zeidner N. (2015) Serological evidence of Coxiella burnetiid infection in cattle and goats in Bangladesh. **EcoHealth** 12:354-358

Mazet JAK, Wei Q, Zhao GP, Cummings DAT, Desmond JS, Rosenthal J, King CH, Cao WC, Chmura AA, *Hagan EA*, Zhang SY, Xiao XM, Zu JG, Shi ZL, Feng F, Liu XP, Pan WQ, Zhu GJ, Zuo LY, Daszak P. (2015) Joint China-US call for employing a transdisciplinary approach to emerging infectious diseases. **EcoHealth** 12:555-559.

Hu B, Chmura AA, Li JL, Zhu GJ, Desmond JS, Zhang YZ, Zhang W, *Epstein JH*, Daszak P, Shi ZL. (2014) Detection of diverse novel astroviruses from small mammals in China. **Journal of General Virology** 95:2442-2449.

Emily A Hagan
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: hagan@ecohealthalliance.org

Professional Preparation

Hiram College, OH	Biology, Biomedical Humanities	B.S.	2008
Columbia University, NY	Epidemiology	M.P.H.	2013

Appointments

Research Scientist, EcoHealth Alliance	2016 - present
PREDICT Bangladesh Country Liaison, EcoHealth Alliance	2016 - present
Research Coordinator, EcoHealth Alliance	2015 - 2016
Research Assistant, EcoHealth Alliance	2013 - 2015
Team Manager, Beth Israel Deaconess Medical Center	2011 - 2012
Research Assistant, Beth Israel Deaconess Medical Center	2008 - 2012
Teaching Assistant, Hiram College Organic Chemistry Department	2007 - 2008
NSF REU Research Intern, University of Akron, Polymer Department	2007 - 2007
Researcher, Hiram College Cellular and Molecular Lab	2006 - 2007

Publications

Wang N, Li S, Yang X, Huang H, Zhang Y, Guo H, Luo C, Miller M, Zhu G, Chmura AA, Hagan E, Zhou J, Zhang Y, Wang L, Daszak P, Shi Z (2018). Serological evidence of bat SARS-related coronavirus infection in humans, China. **Virologica Sinica**, 33(1):104-107.

Miller M, Hagan E (2017). Integrated biological–behavioural surveillance in pandemic-threat warning systems. **Bulletin of the World Health Organization** 95(1):62.

Mazet JAK, Wei Q, Zhao G, Cummings D, *Desmond JA*, Rosenthal J, King CH, Cao, Wuchun, Chmura A, Hagan EA, Zhang S, Xiao X, Xu JA, Zhengli S, Liu X, Pan W, Zhu GA, Zuo L, Daszak P (2015) Joint China–US Call for an Interdisciplinary Approach to Emerging Infectious Diseases. **EcoHealth** 12(50).

Schmitz JE, Ma ZM, Hagan EA, Wilks AB, Furr KL, Linde CH, Zahn RC, Brenchley JM, Miller CJ, Permar SR (2012) Memory CD4+ T lymphocytes in the gastrointestinal tract area major reservoir of simian immunodeficiency virus in chronic nonpathogenic infection of African green monkeys. **Journal of Virology** 86(20):11380-5.

Finstad S, Zhang G, Jin C, Linde C, Hagan EA, de la Rosa M, Zahn RC, Wang X, Reimann K, Gaufin T, Apetrei C, Pandrea I, Miller CJ, McCune J, Picker LJ, Lifson J, Piatak M, Alter G, Veazey RS, Barouch D, Hessell AJ, Burton DR, Nimmerjahn F, Alexander F, Alam SM, Haynes B, Gelman R, Brusic V, Letvin N, Schmitz JE (2010). Effect of Fc gamma-r receptor polymorphisms in rhesus macaques on SIVmac251 setpoint viremia. **AIDS Research and Human Retroviruses** 26(10):A20-A20

Niewiarowski PH, Lopez S, Ge L, Hagan E, Dhinojwala A (2008) Sticky gecko feet: The role of temperature and humidity. **PLoS ONE** 3(5): e2192

Mosoka Fallah
National Public Health Institute of Liberia, Congo Town Back Rd., Monrovia, Liberia
E-mail: mfallah1969@gmail.com

Professional Preparation

University of Liberia	Biology/Chemistry	B.S.	2001
University of Liberia	Medicine	M.D.	2004
Kent State University, OH	Eval. and Measurement	M.A.	2006
University of Kentucky, KY	Immunology	Ph.D.	2011
Harvard University, MA	Global Health	MPH	2012

Appointments

Part-Time Lecturer, Harvard Medical School	2018 - present
Deputy Director General, National Public Health Institute of Liberia	2017 - present
Co-Team Leader- WHO Working Group of Personal Protective Equipment	2017 - present
Visiting Scientist, Harvard Chan School of Public Health	2015 - 2018
Consultant, The Lutheran Malaria Initiative, Synod, Missouri	2013 - 2015
Lead Public Health Consultant, African Development Associates (ADEAS)	2012 - present
Research Intern, MD Division of Global Psychiatry, MA General Hospital	2012 - 2013

Publications

PREVAIL III Study Group, Sneller MC, Reilly C, Badio M, Bishop RJ, Eghrari AO, Moses SJ, Johnson KL, Gayedyu-Dennis D, Hensley LE, Higgs ES, Nath A, Tuznik K, Varughese J, Jensen KS, Dighero-Kemp B, Neaton JD, Lane HC, Fallah MP. (2019) A Longitudinal study of Ebola sequelae in Liberia. **The New England Journal of Medicine** 380(10):924-934.

Richardson ET, Fallah MP. (2019) The genesis of the Ebola virus outbreak in west Africa. **The Lancet Infectious Diseases** 19(4):348-349.

Fallah MP, Skrip LA. (2019) Ebola therapies: An unconventionally calculated risk. **Lancet** 393(10174):850-852.

Kelly JD, Weiser SD, Wilson B, Cooper JB, Glayweon M, Sneller MC, Drew C, Steward WT, Reilly C, Johnson K, Fallah MP. (2019) Ebola virus disease-related stigma among survivors Declined in Liberia over an 18-month, post-outbreak period: An observational cohort study. **PLoS Neglected Tropical Diseases**13(2):e0007185.

Dokubo EK, Wendland A, Mate SE, Ladner JT, Hamblion EL, Raftery P, Blackley DJ… Fallah MP. (2018) Persistence of Ebola virus after the end of widespread transmission in Liberia: An outbreak report. **The Lancet Infectious Diseases** (9):1015-1024.

Fallah MP, Skrip LA, Enders J. (2018) Preventing rural to urban spread of Ebola: Lessons from Liberia. **The Lancet** 392(10144):279-280.

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Moon S, Sridhar D, Pate MA, Jha AK, Clinton C, Delaunay S, Edwin V, Fallah M, Fidler DP, Garrett L, Goosby E, Gostin LO, Heymann DL, Lee K, Leung GM, Morrison S, Saavedra J, Tanner M, Leigh JA, Hawkins B, Woskie LR, Piot P. (2015). Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola. **Lancet** 386(10009):2204-2221.

Wolfe CM, Hamblion EL, Schulte J, Williams P, Koryon A, Enders J, Sanor V, Wapoe Y, Kwayon D, Blackey D, Laney AS, Weston EJ, Dokubo EK, Davies-Wayne G, Wendland A, Daw VTS, Badini M, Clement P, Mahmoud N, Williams D, Gasasira A, Nyenswah TG, Fallah M. (2017) Ebola virus disease contact tracing activities, lessons learned and best practices during the Duport Road outbreak in Monrovia, Liberia, November 2015. **PLOS Neglected Tropical Diseases**. 11(6):e0005597.

Jonathan H. Epstein
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: epstein@ecohealthalliance.org

Professional Preparation

Brandeis University, MA	Biology	B.A.	1996
Tufts University Sch. Vet. Med., MA	Wildlife Med.	D.V.M.	2002
Tufts University Sch. Vet. Med., MA	Zoonotic Diseases	Cert.	2002
Tufts University Sch. Vet. Med., MA	Epidemiology	MPH	2002
Kingston University, UK	Disease Ecology	Ph.D.	2017

Appointments

Extern, Div. of Viral and Ricksettsial Diseases, CDC	2002
Senior Research Scientist, EcoHealth Alliance	2003 - 2009
Adjunct Clinical Associate, Tufts University Cummings School of Vet. Med.	2003 - present
Laboratory Research Fellow (External), Center for Infection and Immunity	2006 - 2011
Associate Vice President, Conservation Medicine Program, EcoHealth Alliance	2009 - 2016
Executive Director, Consortium for Conservation Medicine, EcoHealth Alliance	2009 - 2016
Adj. Associate Professor, Columbia University Mailman School of Public Health	2016 - present
Vice President for Science and Outreach, EcoHealth Alliance	2016 - present

Publications

Epstein, J.H.*, Prakash, V., Smith, C.S., Daszak, P., McLaughlin, A.B., Meehan, G., Field, H.E., and Cunningham, A.A. (2008). Evidence for Henipavirus infection in Indian *Pteropus giganteus (*Chiroptera; Pteropodidae) fruit bats. ***Emerging Infectious Diseases*** 14(8):1309-11.

Pulliam JRC, Epstein JH, Dushoff J, Rahman SA, Bunning M, HERG, Jamaluddin AA, Hyatt AD, Field HE, Dobson AP & Daszak P and the Henipavirus Ecology Research Group (HERG). (2012). Agricultural intensification, priming for persistence, and the emergence of Nipah virus: a lethal bat-borne zoonosis. **J Roy Soc Interface** 9:89-101

Daszak P, Zambrana-Torellio C, Bogich TL, Fernandez M, Epstein JH, Murray KA, Hamilton H (2013). Interdisciplinary approaches to understanding disease emergence: The past, present and future drivers of Nipah virus emergence. **PNAS** 110:3681-3688

Emily S Gurley, Sonia T Hegde, Kamal Hossain, Hossain MS Sazzad, M. Jahangir Hossain, Mahmudur Rahman, M A Yushuf Sharker, Henrik Salje, M Saiful Islam, Jonathan H Epstein, Salah Uddin Khan, A Marm Kilpatrick, Peter Daszak, Stephen P Luby. Convergence of Humans, Bats, Trees, and Culture in Nipah Virus Transmission, Bangladesh. **Emer. Infect. Dis**. 2017;23(9):1446-1453.

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Ge X-Y, Li J-L, Yang X-L, Chmura AA, Zhu G, Epstein JH, Mazet JK, Hu B, Zhang W, Peng C, Zhang Y-J, Luo C-M, Tan B, Wang N, Zhu Y, Crameri G, Zhang S-Y, Wang L-F, Daszak P, Shi Z-L (2013). Isolation and characterization of a bat SARS-like Coronavirus that uses the ACE2 receptor. **Nature** 503:535-538.

Anderson DE, Islam A, Crameri G, Todd S, Islam A, Khan SU, Foord, A, Rahman, MZ, Mendenhall, IH, Luby, SP, Gurley, ES, Daszak, P, Epstein, JH*, and Wang, LF. Isolation and full-genome characterization of Nipah viruses from bats, Bangladesh. **Emerg Infect Dis.** 2019 Jan

Claire J Standley
Center for Global Health Science & Security, Georgetown University, Washington DC, USA
E-mail: Claire.standley@georgetown.edu

Professional Preparation

University of Cambridge, UK	Zoology	B.A.	2006
University of Oxford, UK	Biodiversity, Conservation, Management	MSc	2007
University of Nottingham, UK	Genetics	PhD	2011

Appointments

Assistant Research Professor, Georgetown University	2016 - present
Professorial Lecturer, The George Washington University	2014 - present
Senior Research Scientist, The George Washington University	2014 - 2016
AAAS Science and Technology Policy Fellow, US Dept. of State	2012 - 2014
Postdoctoral Research Associate, Princeton University	2010 - 2012

Publications

Katz R, Standley CJ. (2019) Regional approaches for enhancing global health security. **BMC Public Health**, 19(3):473.

Standley CJ, Muhayangabo R, Bah MS, Barry AM, Bile E, Fischer JE, Heegaard W, Koivogui L, Lakiss SK, *Sorrell EM*, VanSteelandt A, Dahourou AG, Martel LD (2019) Creating a national specimen referral system in Guinea: Lessons from initial development and implementation. **Frontiers in Public Health** 7:83.

Standley CJ, Boyce MR, Klineberg A, Essix G, Katz R. (2018) Organization of oversight for integrated control of neglected tropical diseases within Ministries of Health. **PLoS Neglected Tropical Diseases** 12(11):e0006929.

Standley CJ, Graeden E, Kerr J, *Sorrell EM*, Katz R. (2018) Decision support for evidence-based integration of disease control: A proof of concept for malaria and schistosomiasis. **PLoS Neglected Tropical Diseases** 12(4):e0006328

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Standley CJ, *Sorrell EM*, Kornblet S, Fischer JE, Katz R. (2015) Implementation of the International Health Regulations (2005) through cooperative bioengagement. **Frontiers in Public Health** 3:231.

Standley CJ, Goodacre SL, Wade CM, Stothard JR.(2014) The population genetic structure of *Biomphalaria choanomphala* in Lake Victoria, East Africa: Implications for schistosomiasis transmission. **Parasites & Vectors** 7:524.

Standley CJ, Bogich T. (2013) International Development, Emerging Diseases, and Ecohealth. **EcoHealth** 10:1-3.

Harchut K, Standley CJ, Dobson AP, Klaassen B, Rambaud-Althaus C, Althaus F, Nowak K. (2013) Over-diagnosis of malaria by microscopy in the Kilombero Valley, Southern Tanzania: An evaluation of the utility and cost-effectiveness of rapid diagnostic tests. **Malaria Journal** 12:159.

Standley CJ, Mugisha L, Dobson AP, Stothard JR. (2012) Zoonotic schistosomiasis in non-human primates: Past, present and future activities at the human-wildlife interface in Africa. **Journal of Helminthology** 86(2):131-140.

Noam Ross
EcoHealth Alliance, 460 W 34th St, New York, NY 10001
E-mail: ross@ecohealthalliance.org

Professional Preparation

Brown University	Environmental Science	B.S.	2006
University of California-Davis	Ecology	Ph.D.	2015

Appointments

Senior Research Scientist Ecologist, EcoHealth Alliance	2016 - present
Disease Ecologist, EcoHealth Alliance	2015 - 2016
Graduate Researcher, University of California-Davis	2010 - 2015
Senior Analyst, Environmental Strategy and Markets, GreenOrder	2007 - 2009
Analyst, Environmental Strategy and Markets, GreenOrder	2006 - 2007
Contract Researcher: Energy Efficient Products Initiative, Wal-Mart	2006

Publications

Ross N, Eskew E, Ray N. (2019). Citesdb: An R package to support analysis of CITES Trade Database shipment-level data. **Journal of Open Source Software**, 4(37):1483.

Pedersen EJ, Miller DL, Simpson GL, Ross N. (2019). Hierarchical generalized additive models in ecology: An introduction with mgcv. **PeerJ**, 7, e6876.

Cobb RC, Ross N, Hayden KJ, Eyre CA, Dodd RS, Frankel SJ, Garbelotto M, Rizzo DM. (2019). Promise and Pitfalls of Endemic Resistance for Cultural Resources Threatened by Phytophthora ramorum. **Phytopathology**, 109(5):760–769.

Carlson CJ, Kracalik I, Ross N, Alexander K, Hugh-Jones ME, Fegan M, Elkin B, Epp T, Shury T, Bagirova M, Getz WM, Blackburn JK. (2019). The global distribution of *Bacillus anthracis* and associated anthrax risk to humans, livestock, and wildlife. **Nature Microbiology**.

Rostal MK, Ross N, *Machalaba C*, Cordel C, Paweska JT, *Karesh WB*. (2018) Benefits of a One Health approach: An example using Rift Valley fever. **One Health** 5:34-36.

Olival KJ, Hosseini P, Zambrana-Torrelio C, Ross N, Bogich T, Daszak P. (2017) Host and viral traits predict zoonotic spillover from mammals. **Nature** 546:646–650.

Machalaba C, Smith KM, Awada L, Berry K, Berthe F, Bouley TA, Bruce M, Abrahantes JC, El Turabi A, Feferholtz Y, Flynn L, Fournie G, *Andre A*, Grace D, Jonas O, Kimani T, Le Gall F, Jose J, Peyre MM, Pinto J, Ross N, Ruegg SR, Salerno RH, Seifman R, Zambrana-Torrelio C, *Karesh WB*. (2017) One Health Economics to confront disease threats. **Transactions of the Royal Society of Tropical Medicine and Hygiene** 111(6):235-7.

Salerno J, Ross N, Ghai R, Mahero M, Travis DA, Gillespie TR, Hartter J. (2017) Self-reported fever associated with human-wildlife interactions across park landscapes in western Uganda. **EcoHealth** 14(4):675-690.

Cobb RC, Hartsough P, Ross N, Klein J, LaFever DH, Frankel SJ, Rizzo DM. (2017) Resiliency or restoration: Management of sudden oak death before and after outbreak. **Forest Phytophthoras** 7(1):1-14.

Schreiber S, Ross N. (2016) Individual-based integral projection models: The role of size-structure on extinction risk and establishment success. **Methods in Ecology and Evolution** 7(7):867-74.

Boettiger C*, Ross N*, Hastings A. (2013) Early warning signals: The charted and uncharted territories. **Theoretical Ecology** 6(3):255-64. (*Co-equal authors)

Anne Laudisoit
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: laudisoit@ecohealthalliance.org

Professional Preparation

University of Liege, Belgium	Biological Sciences	Ms.C	2001
University of Liege, Belgium	Parasitology	D.E.A	2003
University of Antwerp and Liege	Plague Epidemiology	Ph.D.	2009

Appointments

Senior Scientist, EcoHealth Alliance, New York, United States	2017 - present
Postdoctoral Research Associate, Global Health Institute, CIFOR	2014 - 2016
Volunteer biologist, Marine Mangrove Park, DRCongo	2015 - present
Post-Doctoral Fellow, University of Liverpool, United Kingdom	2010 - 2013
Post-Doctoral Fellow, Veterinary and Agrochemical Research Center, Belgium	2009 - 2010

Publications

Deom JM., Sala R., Laudisoit A. (2019) **The Ili River Delta: Holocene Hydrogeological Evolution and Human Colonization.** *In: Yang L., Bork HR., Fang X., Mischke S. (eds)* Socio-Environmental Dynamics along the Historical Silk Road. Springer, Cham. P67-94.

Begon M, Davis S, Laudisoit A, Leirs H, Reijniers J. (2019) **Chapter 24 : Sylvatic plague in Central Asia: a case study of abundance thresholds.** *In Wilson, K., Fenton, A., & Tompkins, D. (Eds.).* Wildlife Disease Ecology: Linking Theory to Data and Application (Ecological Reviews). Cambridge: Cambridge University Press.

Mizerovská D, Nicolas V, Demos TC, D Akaibe, Colyn M, Denys C, Kaleme PK, Katuala P, Kennis J, Peterhans JCK, Laudisoit A, Missoup AD, Sumbera R, Verheyen E, Bryja J. (2019) Genetic variation of the most abundant forest-dwelling murid rodents in Central Africa (Praomys jacksoni complex): Evidence for Pleistocene refugia in both montane and lowland forests. **Journal of Biogeography**

Laudisoit A, Tepage F & colebunders R. (2018) Correspondence. Oral Tecovirimat for the Treatment of Smallpox. **The New England Journal of Medicine** 379:2084-2085.

Mandro M, Suykerbuyk P, Tepage F, Rossy D, Ngave F, Hasan MN, Hotterbeekx A, Mambandu G, Kashama JM, Laudisoit A, Colebunders R. (2018) Onchocerca volvulus as a risk factor for developing epilepsy in onchocerciasis endemic regions in the Democratic Republic of Congo: A case control study. **Infectious Diseases of Poverty** 7(1):79.

Lenaerts E, Mandro M, Mukendi D, Suykerbuyk P, Dolo H, Wonya'Rossi D, Ngave F, Ensoy-Musoro C, Laudisoit A, Hotterbeekx A, Colebunders R. (2018) High prevalence of epilepsy in onchocerciasis endemic health areas in Democratic Republic of the Congo. **Infectious Diseases of Poverty** 7(1):68.

Wilschut LI, Heesterbeek JAP, Begon M, de Jong SM, Ageyev V, Laudisoit A, Addink EA. (2018) Detecting plague-host abundance from space: Using a spectral vegetation index to identify occupancy of great gerbil burrows. **International Journal of Applied Earth Observation and Geoinformation** 64:249-255.

Levick B, Laudisoit A, Tepage F, Ensoy-Musoro C, Mandro M, Bonareri Osoro C, et al. (2017) High prevalence of epilepsy in onchocerciasis endemic regions in the Democratic Republic of the Congo.**PLoS Neglected Tropical Diseases** 11(7):e0005732.

Laudisoit A, Collet M, Muyaya B, Mauwa C, Ntadi S, Wendelen W, Guiet A, Helsen P, Baudouin M, Leirs H, Vanhoutte N, Micha JC and Verheyen E. West African Manatee Trichechus senegalensis (LINK, 1795) in the Estuary of the Congo River (Democratic Republic of the Congo): Review and Update. **Journal of Biodiversity & Endangered Species** 5:181.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Catherine C. Machalaba | Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024
Location of Project: New York, NY, USA and South Africa
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support: Belmont Forum/NOAA
Total Award Amount: $1,300,000.00 Total Award Period Covered: 1/01/20 – 12/31/22
Location of Project: New York, NY, USA
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/19
Location of Project: Global
Person-Months Per Year Committed to the Cal: 3.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
READY

Source of Support: USAID
Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018 – 09/30/2021
Location of Project: New York, NY, USA
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Claire Standley	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Strengthening Health Security Systems in Libya: Advancing Laboratory Biorisk Assessments and Implementing Validated Waste Management Systems in Libya's Public Health and Veterinary Laboratories

Source of Support: U.S. Department of State

Total Award Amount: $265,000 Total Award Period Covered: 12/18/2017-12/31-2019

Location of Project: Jordan/Libya

Person-Months Per Year Committed to the Project. Cal: 1.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Developing Laboratory Risk Assessment Tools to Secure Institutions Handling High Consequence Pathogens in Morocco

Source of Support: U.S. Department of State

Total Award Amount: $136,066 Total Award Period Covered: 12/01/2018-12/31/2019

Location of Project: Morocco

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Preventing Terrorist Exploitation of Dangerous Pathogens during Outbreaks by deploying One Health Rapid Response Teams

Source of Support: U.S. Department of State

Total Award Amount: $155,000 Total Award Period Covered: 12/01/2018-12/31/2019

Location of Project: Libya/Tunisia

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Formalizing Biohazardous Waste Management Across Key Health Facilities in Libya

Source of Support: U.S. Department of State

Total Award Amount: $169,163 Total Award Period Covered: projected 10/01/2019-09/30/2020

Location of Project: Libya/Tunisia

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Community and Hospital Event Based Surveillance Tools for CDC

Source of Support: CDC
Total Award Amount: $55,550 Total Award Period Covered: 3/1/2019 – 09/30/2019
Location of Project: USA
Person-Months Per Year Committed to the Cal: 0.7 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

One Health Next Generation
Source of Support: USAID
Total Award Amount: 998,571 Total Award Period Covered: 10/01/2019 – 9/30/2024
Location of Project: Multiple (South-east Asia and Africa)
Person-Months Per Year Committed to the Project. Cal: 1.8 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Creating Tools and Building Capacity for Global Implementation of the International Health Regulations (IHR 2005)
Source of Support: Defense Threat Reduction Agency, US Department of Defense
Total Award Amount: $591,102 Total Award Period Covered: 09/30/2016-09/30/2019
Location of Project: Middle East
Person-Months Per Year Committed to the Project. Cal: 1.8 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Emily Hagan	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024
Location of Project: United States, Liberia
Person-Months Per Year Committed to the Cal: 4.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 12 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH
Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/25
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Michael Wiley

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024
Location of Project: United States, Liberia
Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☐ Current ☐ Pending ☒ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Next Generation Sequencing Capacity Building in Liberia Focused on Viral Hemorrhagic Fever Biopreparedness

Source of Support: DTRA
Total Award Amount: $2,250,000.00 Total Award Period Covered: 01/01/2020-12/31/2025
Location of Project: Liberia
Person-Months Per Year Committed to the Cal: 3.5 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Jonathan Epstein | Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024
Location of Project: Liberia
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Biosurveillance for henipaviruses and filoviruses in hunting communities and on farms in Peninsular Malaysia

Source of Support: DTRA CBEP
Total Award Amount: $4,065,665.38 Total Award Period Covered: 05/1/2017-04/30/2020
Location of Project: United States, Malaysia
Person-Months Per Year Committed to the Cal: 3.72 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
EcoHealthNet 2.0: A One health approach to disease ecology research & education

Source of Support: NSF
Total Award Amount: $499,897.00 Total Award Period Covered: 09/01/2016-08/31/2021
Location of Project: United States
Person-Months Per Year Committed to the Cal: 0.72 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding the Risk of Bat-Bourne Zoonotic Disease Emergence in Western Asia

Source of Support: DTRA
Total Award Amount: $4,391,443.65 Total Award Period Covered: 10/2/2017-10/1/2022
Location of Project: Global
Person-Months Per Year Committed to the Cal: 0.72 Acad: Sumr:

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Jonathan Epstein

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH

Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/2025

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ellen Carlin	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 6.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 6.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:
READY: Augmenting Capacity for Humanitarian Emergencies of Infectious Diseases with Epidemic or Pandemic Potential

Source of Support: USAID

Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018-09/30-2021

Location of Project:

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:
Ground Truth Network

Source of Support: DHS

Total Award Amount: $2,231,114.13 Total Award Period Covered: 9/30/2016-9/29/2021

Location of Project: United States

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Noam Ross	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: United States, Liberia

Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding the Risk of Bat Coronavirus Emergence

Source of Support: NIAID

Total Award Amount: $3,086,735 Total Award Period Covered: 6/01/2014-05/31/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000 Total Award Period Covered: 10/1/2014-9/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding Rift Valley Fever in Republic of South Africa

Source of Support: DTRA

Total Award Amount: $4,936,359 Total Award Period Covered: 5/17/2014-5/16/2019

Location of Project: United States, South Africa

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Expanding Software Peer Review

Source of Support: Sloan Foundation

Total Award Amount: $300,000 Total Award Period Covered: 09/01/2019-08/31/2021

Location of Project: United States

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator:	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Drivers of Nipah virus spillover across Bangladesh

Source of Support: NIAID
Total Award Amount: $3,035,541 Total Award Period Covered: 06/1/2019-12/31/2023
Location of Project: United States, Bangladesh
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,988,526 Total Award Period Covered: 6/1/2019-5/31/1024
Location of Project: United States, South Africa
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
REPEL: Rapid Evaluation of Pathogens to prevent Epidemics in Livestock

Source of Support: DHS S&T
Total Award Amount: $600,000 Total Award Period Covered: 8/01/2019- 07/31/2021
Location of Project: United States
Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH
Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/2025
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Mosoka Fallah | Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024
Location of Project: United States, Liberia
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Partnership for Research on Ebola Virus (PREVAIL) III

Source of Support: NIH/NIAID
Total Award Amount: $15,000,000.00 Total Award Period Covered: 04/30/2015-5/31/2025
Location of Project: Liberia
Person-Months Per Year Committed to the Cal:10.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH
Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/25
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: John Dogba

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 1.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Acute Febrile Illness Project

Source of Support: United States Center for Disease Control

Total Award Amount: $900,000.00 Total Award Period Covered: 01/01/2019 – 12/31/2021

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 12.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Anne Laudisoit	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: United States, Liberia

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT 2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 8.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project: Global

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Michael Garbo

Other agencies (including NSF) to which this proposal has

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH

Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/2025

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: James S. Desmond	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: United States, Liberia

Person-Months Per Year Committed to the Cal: 6.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT 2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH

Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020-02/28/2025

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Next Generation Sequencing Capacity Building in Liberia Focused on Viral Hemorrhagic Fever Biopreparedness

Source of Support: DTRA

Total Award Amount: $2,250,000.00 Total Award Period Covered: 01/01/2020-12/31/2025

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dr. Fatorma Bolay

Other agencies (including NSF) to which this proposal has

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Partnership for Research on Ebola Virus (PREVAIL) III

Source of Support: NIH/NIAID

Total Award Amount: $15,000,000.00 Total Award Period Covered: 04/30/2015-5/31/2025

Location of Project: Liberia

Person-Months Per Year Committed to the Cal:10.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Bode Shobayo

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 1.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Surveillance of acute febrile illness in New Kru and West Point Communities, Montserrado, Liberia

Total Award Amount: $39,402.82 Total Award Period Covered: 01/01/2019 – 09/30/2019

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 9.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Erin Sorrell	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia (current proposal)

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020-12/31/2024

Location of Project: Liberia

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Strengthening Health Security Systems in Libya: Advancing Laboratory Biorisk Assessments and Implementing Validated Waste Management Systems in Libya's Public Health and Veterinary Laboratories

Source of Support: U.S. Department of State

Total Award Amount: $265,000 Total Award Period Covered: 12/18/2017-12/31-2019

Location of Project: Jordan/Libya

Person-Months Per Year Committed to the Project. Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Developing Laboratory Risk Assessment Tools to Secure Institutions Handling High Consequence Pathogens in Morocco

Source of Support: U.S. Department of State

Total Award Amount: $136,066 Total Award Period Covered: 12/01/2018-12/31/2019

Location of Project: Morocco

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Preventing Terrorist Exploitation of Dangerous Pathogens during Outbreaks by deploying One Health Rapid Response Teams

Source of Support: U.S. Department of State

Total Award Amount: $155,000 Total Award Period Covered: 12/01/2018-12/31/2019

Location of Project: Libya/Tunisia

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Formalizing Biohazardous Waste Management Across Key Health Facilities in Libya

Source of Support: U.S. Department of State

Total Award Amount: $169,163 Total Award Period Covered: projected 10/01/2019-09/30/2020

Location of Project: Libya/Tunisia

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

One Health Next Generation

Source of Support: USAID

Total Award Amount: 998,571 Total Award Period Covered: 10/01/2019 – 9/30/2024

Location of Project: Multiple (South-east Asia and Africa)

Person-Months Per Year Committed to the Project. Cal: 1.8 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Creating Tools and Building Capacity for Global Implementation of the International Health Regulations (IHR 2005)

Source of Support: Defense Threat Reduction Agency, US Department of Defense

Total Award Amount: $591,102 Total Award Period Covered: 09/30/2016-09/30/2019

Location of Project: Middle East

Person-Months Per Year Committed to the Project. Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat from high-risk pathogens causing febrile illness in Guinea

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project: Guinea

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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EcoHealth Alliance, New York, USA

EcoHealth Alliance is an US-based NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EcoHealth Alliance scientists have been conducting field research on infectious zoonotic diseases for over three decades. EcoHealth Alliance is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory freezer storage and light microscopy. The scientific staff (15 core scientists, 100+ field staff) is supported by a core admin staff of 11, which is available for work on this project and is also funded through private individual and foundation support.

EcoHealth Alliance is equipped with 25 networked computers (PCs and Macs) including ARRA funded International LifeSize Video Conferencing facilities, and high-speed video conferencing facilities have been installed with key international collaborators. EcoHealth Alliance has access to a 24-7 server, server support, and all required software including ArcGIS, MatLab, SPSS, Microsoft Office, and Adobe CS3 running on both Apple and Windows Operating Systems. Additionally we have a four-processor, public IP addressed Linux server which can be used for intensive computational modeling and database processing by all the grantees.

EcoHealth Alliance is the headquarters of two networks that provide exceptional leverage for the core scientists: 1) The EcoHealth Alliance Local Conservation Partners: A global partnership of 15 NGOs in Asia (including Bangladesh, India, and China), Africa and Latin America (including Argentina and Brazil). This network provides access to fieldwork in countries (such as India) that are often difficult to work in, and obtain samples from; 2) The Consortium for Conservation Medicine: A unique collaborative institution linking Johns Hopkins Bloomberg School of Public Health, Tufts University School of Veterinary Medicine Center for Conservation Medicine, The University of Pittsburgh Graduate School of Public Health, The University of Wisconsin-Madison Nelson Institute for Environmental Studies, The USGS National Wildlife Health Center, and EcoHealth Alliance. The CCM provides access to hundreds of high caliber scientists, their facilities, and their students at 6 leading institutes of public health, veterinary medicine, and environmental science in the USA.

Society for the Conservation of Nature of Liberia (SCNL), Monrovia, Liberia

The Society for the Conservation of Nature of Liberia (SCNL) is an accredited, non-governmental organization based in Monrovia, Liberia that serves as the oldest, most well respected, and important civil service organization devoted to the environment and conservation in Liberia. With over 50+ staff based in the office and in the field, SCNL has had an enormous impact, and has been the driving force behind many conservation efforts in the country.

SCNL partners with numerous international NGO's including the Wild Chimpanzee Foundation, Conservation International, Fauna and Flora International, Liberia Chimpanzee Rescue and Protection, Rainforest Trust, EcoHealth Alliance, World Resources Institute and Birdlife International. SCNL's experience as the implementing partner of PREDICT Liberia

has placed the organization at the forefront of a new paradigm within the public health sector in Liberia. In the post-Ebola environment, Liberia has adopted a One Health approach to public health and because SCNL has played such an important role in operationalizing and promoting this new paradigm, the organization has positioned itself as a leader in the field.

Society for the Conservation of Nature of Liberia (SCNL) is equipped with the necessary equipment and facilities to conduct fieldwork throughout Liberia. Located in Congo Town a suburb of Monrovia, SCNL has easy access to vendors in order to procure supplies. SCNL has several 4WD vehicles able to handle Liberia's rough terrain. SCNL is equipped with 4 Stirling Ultracold portable -86°C freezers, 2 dry shippers to maintain cold chain, 3 mobile centrifuges for use in the field, various sized mist nets, 2 harp traps for catching bats, has a label printer for labeling cryovials. SCNL also has a warehouse built from a converted shipping container and other basic equipment needed to conduct proper field work.

National Public Health Institute of Liberia (NPHIL), Monrovia, Liberia

National Public Health Institute of Liberia (NPHIL) is an autonomous agency of the Government of Liberia. In 2016, through an Act of the Legislature, NPHIL was established to collaborate with and strengthen the Ministry and other institutions in the health sector through the carrying out of research into public health concerns of the Nation and to provide direction for disease prevention activities. NPHIL's facilities include two campuses with the headquarters based in Monrovia, Montserrado County, and research and reference laboratories based in Charlesville, Margibi in Liberia under the Integrated Disease Surveillance and Response (IDSR) System. At the NRL,30% of the staff are core lab technicians, 46% lab aides and 24% lab assistants.

The Division of Public Health and Medical Research (DPHMR) is housed at the Charlesville campus and includes 91 acres with multiple research suites. DPHMR includes three research units in Microbiology, Parasitology and Vector Biology, and Nutritional Epidemiology; and have 13 scientific staff.

NPHIL has a strategic and an operational plan with support from the US Center for Disease Control (CDC), the World Health Organization (WHO) and the US National Institutes of Health (NIH).

NPHIL's Laboratory complex is located in Charlesville, Margibi County. Contained within the facility are two laboratories: the National Public Health Reference Lab and the Medical and Public Health Research lab. The reference lab is responsible for confirming surveillance samples for priority diseases in Liberia and has three sections, namely; molecular, serology and microbiology suites. The Public Health and Medical Research labs are involved with Ebola research in collaboration with the NIH/PREVAIL and studies in Malaria, AMR and Nutritional Epidemiology and also being conducted in these labs. NPHIL's laboratory complex hosts two BSL-2 suites and a BSL-3 lab is currently being completed for work on MDR-TB and other level 3 risk pathogens. The complex is equipped with uninterrupted

power supply from one 250 KVA generator and three backups (One 220KVA and two 155 KVA).

Significant equipment at the NPHIL facilities include ELISA plate readers and washers (2), light-cycler real-time quantitative PCR machines (2) conventional PCR machines (2), GeneXpert Real-time PCR (6), CO_2 incubator (5), class II biosafety cabinets (6), Illumina MiSeq (1), liquid nitrogen (LN2) tanks (3) and a 30 liter per day LN2 generator. Other available equipment includes, gel electrophoresis equipment, conventional microscopes, table top centrifuges, microfuges, Autoclaves, Water distillers, refrigerators and freezers, Millipore Direct Q water purification system, weighing balances and PAPR equipment and chargers.

Trained and competent laboratory staff include seven junior scientists and eight laboratory technicians with proficiency in varying laboratory techniques such as PCR, RT-PCR, serology, blood processing and DNA/RNA extraction, DNA/RNA sequencing and Microbiology.

Liberia Chimpanzee Rescue and Protection, Charlesville, Liberia/Golden, CO, USA

Liberia Chimpanzee Rescue and Protection (LCRP) is an NGO operating in Liberia with a US based 501c3 affiliate. LCRP is one of the leading animal welfare and conservation organizations in Liberia focused on protecting and conserving wildlife, primarily chimpanzees. LCRP has a staff of 22, mostly dedicated to chimpanzee care. One of the co-directors, Dr. James Desmond, DVM, MS, is a veterinarian specializing in great ape health and zoonotic disease research.

LCRP currently operates on the grounds of the National Public Health Institute of Liberia (NPHIL) and has an MOU with the Society for the Conservation of Nature of Liberia (SCNL) and close relationships with the other prominent conservation and public health NGOs operating in the country such as: Conservation, Fauna and Flora International, and Wild Chimpanzee Foundation. In addition, LCRP works very closely with several government entities such as the Forestry Development Authority, Ministry of Agriculture, and NPHIL.

LCRP has four vehicles that are capable of handling the difficult road conditions present in Liberia, several laptop computers, various medical supplies and equipment, and shares office space and facilities with SCNL in Monrovia.

University of Nebraska Medical Center, Omaha, Nebraska, USA

The University of Nebraska Medical Center (UNMC) is a vital enterprise in the nation's heartland and has mission to improve the future of health care in Nebraska and beyond. As Nebraska's only public academic health sciences center, UNMC is committed to the education of a 21st century health care work force, to finding cures and treatments for devastating diseases, to providing the best care for patients, and to serving our state and its communities through award-winning outreach. UNMC is one of four campuses that make up the University of Nebraska

system. UNMC has six colleges, two institutes and a graduate studies program, serving nearly 4,000 students in more than two dozen programs.

The recently established UNMC Global Center for Health Security (GCHS) is one of the nation's primary biosecurity resources for training, education, research, and clinical care. The Center has become the focal point of state, national and international collaborations having created a spectrum of biosecurity and biodefense services to help prepare for natural and man-made disasters. The network of experts help to advance the coordinated, interdisciplinary development of new research and clinical practice and to disseminate innovative approaches to keep communities safe from epidemics and to counter weapons of mass destruction.

The GCHS provides a unique platform for health system preparedness, awareness, recognition, and response for public health and hospital emergencies. With a comprehensive capability in research, education & training, and health system operations, we strive to facilitate 21st-century care for public health emergencies in all environments. Below are some of the centers and initiatives that fall under GCHS.

Nebraska Biocontainment Unit (NBU)

- A collaborative project involving the University of Nebraska Medical Center & Nebraska Medicine (UNMC/NM), as well as the Nebraska Department of Health and Human Services
- The 10-bed unit opened in 2005 and cared for three of the ten patients with Ebola Virus Disease (EVD) managed in U.S. biocontainment units during the Fall of 2014 outbreak
- Now serves as Region VII RESPTC for treatment of Ebola/HCI patients
- Partner with the Nebraska Public Health Laboratory BSL-3 lab at UNMC
- Volunteer-rostered staff of specialty physicians, nurses, technicians, and respiratory therapists, who are trained in high-level isolation and bio-preparedness. These volunteers are employed in other areas of the health system, train quarterly & can report promptly for duty when unit is activated

National Training, Simulation and Quarantine Center (TSQC)

- Selected as the National Training, Simulation, and Quarantine Center in 2017. This $20 million HHS-funded capability will be home to the National Disaster Medical System & CStars ID training programs, and includes:
  - Λ 20-bed National Quarantine Unit, on the 1st floor of UNMC's Davis Global Center building in July 2019
  - The National Biocontainment Training Center, a fully equipped mock-up of a patient biocontainment unit with six patient care rooms, support spaces, autoclave, and training laboratory
  - An Emergency Operations Center(EOC) and multipurpose room for incident management training and skills training. This space will serve as the UNMC/NM EOC for exercises and real-world events
  - Access to the Davis Global Center facility and the interprofessional Experiential Center for Enduring Learning (iEXCEL), which includes a 360 degree laser projection simulated

environment immersion cave, CAD wall, iWall, holographic theater, and other virtual- and augmented-reality training & simulation tools

Nebraska Drug Development Pipeline

- Collaboration among the Department of Defense, the National Strategic Research Institute (NSRI), the University of Nebraska-Lincoln, UNMC, and the pharmaceutical industry to develop new therapeutics and radiation countermeasures, products not currently prioritized for development
- An expandable model for other public health emergency countermeasures

Nebraska Mobile Genomics Unit

- Able to respond to a public health emergency by providing genomic characterization of the pathogen at the site of the outbreak
- Setup sequencing laboratory and provided training to local scientist in the Democratic Republic of the Congo, in May 2018.

U.S. Air Force Center for the Sustainment of Trauma and Rediness Skills (C-STARS)

- First C-STARS infectious disease program dedicated to developing protocols, best practices, and training for USAF medical personnel in the care and transport of individuals with active or suspected HCI
- Established in late 2018 and projected to begin full-scale training in late 2019

Georgetown University, Washington, DC, USA

The Georgetown University Medical Center (GUMC) consists of a nationally-ranked School of Medicine (SOM), School of Nursing & Health Studies (NHS), Lombardi Comprehensive Cancer Center (LCCC), and Biomedical Graduate Research Organization (BGRO). GUMC is home to more than 400 basic and clinical research scientists, and 300 active clinical trials. Clinical care is provided at Medstar Georgetown University Hospital (MGUH) and satellite clinics through a partnership with MedStar Health, Inc. The Georgetown University Medical Center is the largest and most prominent Catholic medical center in the country.

Georgetown's School of Medicine provides a comprehensive approach to medical education, following the Jesuit ideal of *cura personalis*, or "care of the whole person." As one of the most selective medical schools in the country, the School of Medicine is consistently ranked in US News and World Report's top 50 graduate programs at research universities. In 2004, the School of Medicine opened its Integrated Learning Center, which supports the School of Medicine's emphasis on a patient centered, competence-based curriculum and provides the latest methods of clinical teaching and evaluation. Georgetown medical students consistently match into top medical schools around the country for their residency programs.

LABORATORY

GU does not anticipate requiring laboratory facilities for the purposes of their contribution to the research project. We anticipate all laboratory activities will take place in Liberia, as part of the capacity building effort inherent to the proposal. However, if required, there is also extensive reach-back laboratory facilities available via GUMC as needed, including the state of the art Discovery Center in the School of Nursing and Health Sciences. Located on the third floor of the School of Medicine's Med-Dent Building, accessible at 3900 Reservoir Road NW, the Discovery Center covers 3,000 square feet and includes a teaching laboratory, a research laboratory, a cell culture room, and a Zeiss Axiovert 200 microscope. The facility is equipped with modern laboratory teaching tables and equipment; adjacent to the teaching laboratory is a preparation and instrumentation room that serves both the teaching laboratory and the interconnected research laboratory, which houses a separate cell culture room. The research areas are outfitted with state-of-the-art shared core instrumentation that includes centrifuges, cell incubators, microscopes, DNA amplifying, electronic cell counting and electrophoresis equipment. While primarily used by students and faculty within the Department of Human Science, students from the other academic departments at Nursing and Health Sciences also take courses and conduct scientific investigation with faculty in this core, shared facility. Additional laboratory facilities are available via the Department of Microbiology and Immunology in GUMC. Specific laboratory space for virology studies can be made available for students for training in laboratory techniques including RNA extraction, PCR and sequencing.

COMPUTER

The PI, Co-PI, and all research staff at Georgetown University have exclusive use of PC-based desktop computers with extended RAM, significant GB hard disk space, dual-color flat-panel LCD monitors, and high-speed HP laser printers. The PI and Co-PI will also have access to exclusive access to Macbook Pro or Dell laptops. Available software for desktop and laptop computers used for the project includes WINDOWS and Mac operating systems, MS-Office 2010, SPSS 20.0, and SAS 9.3. Study personnel will have full Internet and e-mail access; will be networked to shared, secure drives for data access; and will have full communication capabilities through the use of phone, fax, and email. GUMC provides complete hardware, software, and network support through its University Information Systems department. Box is also available for secure storage and access of files and folders on the Internet enabling the user to access files from any available computer with a web browser and Internet connection.

OFFICE

All study investigators have secured private offices and study personnel also have office space. All investigators have access to conference rooms with video and teleconferencing equipment.

HUMAN SUBJECT REGULATORY COMPLIANCE TRAINING

The PI has completed on-line certification from the IRB and NIH related to protection of human subjects in research. Georgetown University Policy on Protection of Research Data Standard operating procedures regarding data protection and patient confidentiality have been adopted throughout the institution. Office spaces, databases, and e-mail usage all have specific security requirements. The University and Medical Center recently launched a new effort regarding protection of patient data. The PI and other members of the research team will attend relevant seminars/trainings.

OTHER

All research team members have direct access to a full range of library, computer, audiovisual, shop, and clinical facilities at GUMC.

SHARED RESOURCES

Although additional resources are not anticipated to be required for GU's contribution to the project, the following shared resources are available as needed as reach-back capability or for provision of subject matter expertise while developing and implementing the research project in Liberia.

Animal Models Shared Resource (AMSR) and Division of Comparative Medicine (DCM)

Animal models are powerful cancer research tools and a vital link in translating laboratory studies into the clinic. The function of the Animal Models Shared Resource (AMSR) is to facilitate efficient, economical, and state-of-art use of animals for the performance of cancer-related studies. This is accomplished through a centralized resource, where AALAS-certified, highly trained veterinary technicians provide preclinical research services. A significant emphasis is placed on assisting users with the design and performance of animal studies using a wide-range of models, including zebrafish and a recently developed model to study endocrine resistance and breast cancer recurrence in an estrogen receptor positive rat model. Major services provided include all aspects of rodent studies, such as establishing genetically modified mouse colonies, administrating carcinogens, monitoring tumor growth, collecting tissues and tumors at necropsy, and administering drugs, diets or other compounds. Studies using zebrafish include generating gene knockout or gene overexpressing models, screening for toxicity/drugs, and xenotransplantation experiments. Imaging services are also provided to monitor tumor initiation, progression, and response to therapy.

The AMSR is located within Georgetown University Medical School's Division of Comparative Medicine (DCM). The DCM is a centralized, AAALAC-accredited, USDA-registered animal facility and has an approved letter of assurance on file at the NIH. The DCM is a 50,000 sq ft facility located in the Georgetown University Medical Center. It was originally constructed in 1984 as a research resource facility. It was later expanded in 1994 and became the Division of Comparative Medicine. There are a variety of different areas within the DCM that range from barrier level protection to bio safety level 2 containment. The DCM also has surgical and procedure rooms, a cage wash area, autoclaves, cold boxes, dedicated loading docks, a Hydropac machine, and feed and bedding storage.

The animal housing locations in the DCM include:

- A and B zones as well as perimeter rooms: A combination of conventional and SPF housing rooms, using either ventilated caging systems or static "shoebox" cages. There are also rooms designed to house large animals and for aquatic species.
- C, E, & F zones: Rodent barrier areas specifically designed to offer our highest level of bio-security.
- D zone: Designed and used for research with hazardous materials.

All of our areas are climate controlled to control temperature, humidity and lighting to fall within the recommendations of "The Guide for the Care and Use of Laboratory Animals".

The doors to each zone are security controlled using the University's GoCard system. Access must be requested and approved by the main office before entering any zone. The AMSR is codirected by Leena Hilakavi-Clarke, PhD, and Christopher Albanese, PhD, who oversee the animal and imaging components, respectively. The DCM is directed by Dr. Patricia Foley, DVM.

Biostatistics & Bioinformatics Shared Resource (BBSR) goal is to provide basic, translational, clinical and population science investigators with access to high quality statistical science and informatics. Ming Tan, PhD, Chair of the Biostatistics, Bioinformatics, and Biomathematics Department and Subha Madhavan, PhD, Director of Innovation Center for Biomedical Informatics are Codirectors of BBSR. BBSR functions include: study design; statistical analysis and reporting of research studies including clinical trials, studies with high dimensional "omics" and imaging data including pathway analysis; review and monitoring of clinical protocols through membership on the Protocol Review and Monitoring System and Data and Safety Monitoring Committees; and provision of biostatistics and informatics training and expertise in the collection, integration, management, and application of biomedical data. In addition, the BBSR provides investigators with advanced statistical and bioinformatics methods and expertise developed independently by BBSR faculty. The BBSR has excellent computing resources, informatics systems, and informatics and statistical software necessary for efficient and effective support of research. BBSR supports the development of the information architecture for connecting data and metadata from clinical, biospecimen, and research systems to enable all forms of research.

Clinical Research Unit (CRU) is located on 7th floor East Wing of the Main Building, Georgetown University Hospital (GUH). This location is central to the medical center, and is convenient for investigators, clinicians, staff, patients and families. The GU-CRU is equipped to provide around-the-clock support for research studies, seven days a week.

The GU-CRU provides 10 patient-care rooms and occupies approximately 5411 square feet of space. It has the flexibility to support either inpatient or outpatient services, thereby, maximizing use of all rooms (2 are dedicated for cognitive testing; 4 are dedicated for outpatient testing; 4 are mixed inpatient/outpatient use). The GU-CRU, although a University unit, is part of the MedStar JCAHO approved institution.

The GU-CRU provides outpatient and inpatient clinical research support to both pediatric and adult research subjects. Some of the procedures that nurses currently perform or assist with include:

- Exercise Stress Testing
- Pulse Wave Analysis
- Chemotherapy Administration
- Complex Pharmacokinetic Sampling and Collection
- Complex Sample Processing

- Expert IV / Phlebotomy Services
- Insulin Clamp Studies
- Diabetes Education
- Vaccination
- Telemetry
- Cognitive Testing
- Specialized Room for Cognitive Testing with Video Monitoring
- Complex Medication Administration with Monitoring
- 6-Minute Walk Testing
- Lumbar Puncture
- Allergy Testing
- Metabolic Cart and Pulmonary Function Testing
- DXA Hologic Q Series

The staff of the GU-CRU is not limited to these procedures. The GU-CRU staff are continually learning and extending their capabilities based on the needs of the investigators.

Cultural and Linguistic Competence Resources Faculty, postdoctoral fellows, staff, and researchers also have access to The National Center for Cultural Competence (NCCC) provides national leadership and contribute to the body of knowledge on cultural and linguistic competency within systems and organizations. Major emphasis is placed on translating evidence into policy and practice for programs and personnel concerned with health and mental health care delivery, administration, education and advocacy. The NCCC is a component of the Georgetown University Center for Child and Human Development (GUCCHD) and is housed within the Department of Pediatrics of the Georgetown University Medical Center. The NCCC provides training, technical assistance, and consultation, contributes to knowledge through publications and research, creates tools and resources to support health and mental health care providers and systems, supports leaders to promote and sustain cultural and linguistic competency, and collaborates with an extensive network of private and public entities to advance the implementation of these concepts. The NCCC provides services to local, state, federal, and international governmental agencies, family advocacy and support organizations, local hospitals and health centers, healthcare systems, health plans, mental health systems, universities, quality improvement organizations, national professional associations, and foundations. In addition, the NCCC's on-line training, publications, and products are accessed by tens of thousands of individuals each year.

Data Management Core (DMC) provides research investigators at LCCC with high-quality survey data collection and management services, study tracking, data cleaning and data manipulation services as well as consultation services for all population science research projects.

For this study the Core will be responsible for programming the study surveys in REDCap - a secure, IRB-approved, web-based application designed for managing online surveys and for communication between study sites; and develop a tracking database application in MS Access to track study participants from both sites – LCCC and JTCC, throughout the study from

recruitment to study closeout. The Core will be responsible for checking, cleaning and curating the study data collected at different time points in the study to ensure completeness and accuracy of data. The Core will also be responsible for interpretation, organization, validation and merging of data from the survey and tracking database applications along with abstracted EMR/hospitalization/medical event records. They will use advanced data manipulation techniques to create, manipulate, validate and analyze study data and provide ready to use analytic datasets to statisticians and investigators during and at the end of the study. They will provide ongoing maintenance of the Survey and Tracking data applications throughout the study period and backup and secure all study data as per institution standards.

The tracking database will reside on a Georgetown server and can only be accessed using the Georgetown login and a database login. Staff at JTCC will be provided with affiliate Georgetown NetIDs so that they can remotely access the study tracking MS Access database on the server via remote desktop. The web-based survey application, REDCap, is also hosted on a secure Georgetown server that can only be accessed via a secure study login.

Library Resources provide optimum services, facilities and resources to enhance the pursuit of knowledge and academic excellence. The present holdings of all University libraries total over 1,740,000 volumes and 1,850,000 microforms. The Joseph Mark Lauinger Memorial Library has a collection of over one million volumes. Georgetown is a U.S. Government Documents Depository. Blommer Science Library covers the subject fields of biology, chemistry, mathematics, physics, and computer science. The book and bound journal collection there numbers over 63,000 volumes; and almost 900 journals are currently received. Other library resources include: The Maternal and Child Health Library, the Woodstock Theological Library and the National Reference Center for Bioethics Literature. The John Vinton Dahlgren Memorial Library is the major library for the Georgetown Medical Center. The Library occupies over 31,000 square feet on four levels. The staff is comprised of academic librarians, computer scientists, and support staff. The Library provides access to several medical databases including MEDLINE, EMBASE Alerts, and the Micromedex drug information system. The library's print collection includes more than 176,442 volumes (including 43,372 books and 118,188 bound journal volumes), current subscriptions to 1,831 journals, and over 2,700 audiovisual and microcomputer software programs.

Survey, Research, and Biospecimen Collection Shared Resource (SRBSR) was established in July 2011, encompasses and expands upon two prior Shared Resources, the Clinical and Molecular Epidemiology Shared Resource (CMESR) and the Familial Cancer Registry (FCR). Led by a clinical investigator (Isaacs) and a genetic counselor (Peshkin), the SRBSR has created a platform for a unified subject recruitment infrastructure to streamline subject recruitment into nontherapeutic studies while minimizing redundancy of data collection across individual studies through a protocol called the Lombardi Research Participant Registry (LRPR). From protocol activation (6/18/12) to 12/31/12, the SRBSR team has enrolled 547 subjects to the LRPR, which includes access to medical records, data, fluid and tissue biospecimens from consented subjects. These data are useful for pilot studies and project design. Essentially all (98.5%) of these subjects also consented to be re-contacted for participation in future nontherapeutic research studies for which they may be eligible. The SRBSR has successfully utilized the LRPR to triage and enroll 84 subjects into seven investigator- initiated studies at LCCC as of 12/31/12. The

biospecimen repository, built by the subsumed Shared Resources, includes over 2,000 BRCA1/2 characterized subjects with a family history of cancer as well as over 1,800 subjects with sporadic cancer, many with clinical and demographic data. Integration of databases of several Shared Resources is underway with the goal of integrating all clinical and research information into the Georgetown Database of Cancer (G-DOC®). Patient and participant confidentiality is maintained with careful standard operating procedures across the SRBSR and its associated studies.

Office of Minority Health and Health Disparities Research is a new community based space for The Georgetown Office of Minority Health and the Health Disparities, led by Dr. Lucile L. Adams-Campbell, opened in 2011, located at 1000 New Jersey Ave, SE, Washington, DC, 20003. The new space allows for improved access between LCCC and minority and underserved communities which facilitate research engaging the local minority community in our effort to address cancer health disparities. The location is 15 minutes from Lombardi and in close proximity to metro stops and several bus lines, which provide easy access to the community outside of Georgetown.

The office space measures 4,437 square feet, and includes 8 offices for faculty and patient/participant intake privacy, and 9 modular offices for staff, graduate students and postdoctoral fellows. Each staff member is provided with a data encrypted desktop computer, or equivalent. The suite also houses a conference room, reception and waiting areas, photocopy machine, and data/voice access. There is also an exercise physiology lab, and a nutritional education area that includes a kitchen. The exercise physiology lab includes a metabolic unit, treadmills, elliptical machines, and weight training machines. In addition there are 2 Wii-Fit exercise rooms including video games and televisions, and a room with a DEXA machine, which measures body position. The nutritional education area includes a wet sink and kitchen.

University Information Services (UIS) is located in St. Mary's Hall and provides the technology infrastructure to support the teaching and scholarship activities of the school and will be the main resource for instructing students in computer programs (i.e., Excel, PowerPoint) to facilitate learning. Faculty members collaborate with UIS personnel to optimize technology support. Additionally, the school has its own systems manager to provide on-site assistance for faculty, students, and staff for issues pertaining to hardware, software, and Internet-based functions.

ATTACHMENT 3 – SUPPORTING DOCUMENTATION

1. FOREIGN PRINCIPLE INVESTIGATORS AND OTHER MEMBERS OF FOREIGN RESEARCH TEAM

Foreign PI:
None

Foreign Co-I:
Mosokah Fallah, PhD, MPH, MA
Deputy Director General/Technical Services, National Public Health Institute of Liberia

Other members (alphabetical order):
Fatorma Bolay, PhD, MS
Director of Public Health and Biomedical Research, National Public Health Institute of Liberia

John Dogba, MPH
Director of the National Public Health Reference Laboratory, National Public Health Institute of Liberia

Michael Garbo, MS
Executive Director, Society for Conservation of Nature, Liberia

Anne Laudisoit, PhD
Senior Scientist, EcoHealth Alliance, United States of America

Bode I. Shobayo, MSc
Research Scientist, Division of Medical and Public Health Research, National Public Health Institute of Liberia

2. DESCRIPTION OF RELATIONSHIP BETWEEN PROJECT AND CURRENT RESEARCH EFFORTS OF FOREIGN RESEARCH TEAM

PI William Karesh is the Technical Lead on USAID's PREDICT project. Since 2015, PREDICT's Ebola Host Project has operated in Liberia, sampling thousands of wild animals and discovery new viruses in circulation in some of these populations. Co-PI Jonathan Epstein and James Desmond support this project through field sampling, scientific oversight, and project management.

Co-PI James Desmond is an American citizen living in Liberia. He has worked closely with Mosokah Fallah, Fatorma Bolay, John Dogba, and Bode Shobayo, as well as with the director of NPHIL, Tolbert Nyasewah, on the Ebola Host Project since 2015.

Co-PI Ellen Carlin and Catherine Machalaba worked most recently with the National Public Health Institute of Liberia in 2018 to develop a global health security gaps analysis. We engaged NPHIL, the Ministry of Health, and the Ministry of Agriculture in a roundtable to support data and information gathering for this project. We also worked with Co-PI James Desmond on this analysis.

Catherine Machalaba is a policy research on the project, "Forest Health Futures, Liberia," which launched in Liberia in 2019. Ms. Machalaba is working with James Desmond and key partners (e.g., Liberia's Forestry Development Authority, NPHIL, Environmental Protection Agency of Liberia) on applied research to understand the bioeconomics of forest resources and how they relate to human health and conservation.

Through the USAID PREDICT project in Liberia, Ms. Machalaba works closely with the country's One Health Coordination Platform to evaluate operational strategies for cost-effective risk reduction measures.

3. FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance, New York, USA
EcoHealth Alliance is an NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EcoHealth Alliance scientists have been working on spatial modeling of zoonoses for over 15 years, and on modeling of infectious disease emergence and spread for over a decade. EcoHealth Alliance is based in New York City with 10,000 square feet of office space. The scientific staff (31 core scientists, 100+ field staff) is supported by a core admin staff of 18 who are available for work on this project and funded through foundation and federal support. EcoHealth Alliance does not support diagnostic facilities at its core headquarters and works in partnership with a network of leading diagnostic labs in the USA and around the world.

EcoHealth Alliance is equipped with fiber optic Internet access and video conferencing facilities to facilitate easy communication between collaborators. EcoHealth Alliance employees have around the clock access to servers, VPNs, encryption software, IT support, and all necessary software including Git and Github (hosted software revision/audit service), Sublime and Vim text editors, Vagrant and Oracle Virtualbox virtual machines, Google Apps (hosted email and collaboration web based software), Ansible (server provisioning software framework), Python, NodeJS, and R programming languages, Meteor (Javascript framework), Bash shell scripts, Jenkins (continuous integration server), Microsoft Office and Adobe CS6 running on both Apple Mac OS X, Ubuntu linux, and Windows Operating Systems. Additionally, EcoHealth Alliance has a dedicated quad-core Linux server and another dedicated dual quad-core Mac Pro Server - each with 4TB hard drives. Either server individually or in combination may be used for intensive computational modeling and/or database processing by all the grantees. Access to the cloud and supercomputing services (Amazon) is provided by core funding to EcoHealth Alliance.

EcoHealth Alliance is the headquarters of a global network of over 70 partners that

provides exceptional leverage for the core scientists. This network includes staff from: intergovernmental agencies (WHO, OIE, FAO, DIVERSITAS, IUCN); locally-based wildlife conservation organizations in Asia, Africa and Latin America; infectious disease surveillance laboratories including BSL-3 and -4 laboratories; and scientific institutions. EcoHealth Alliance is the headquarters of the One Health Alliance of South Asia (OHASA); the Consortium for Conservation Medicine (CCM); the journal *EcoHealth*; an NSF Research Coordination Network (EcoHealthNET); the IUCN Wildlife Health Specialist Group; and the OIE Wildlife Health Network. EcoHealth Alliance is a member of the IUCN and Columbia University's Center for Environmental Research and Conservation (CERC), so that many scientific staff are adjuncts at Columbia University's E3B Department, or in the Mailman School of Public Health.

National Public Health Institute of Liberia
National Public Health Institute of Liberia (NPHIL) is an autonomous agency of the Government of Liberia. In 2016, through an Act of the Legislature, NPHIL was established to collaborate with and strengthen the Ministry and other institutions in the health sector through the carrying out of research into public health concerns of the Nation and to provide direction for disease prevention activities. NPHIL's facilities include two campuses with the headquarters based in Monrovia, Montserrado County, and research and reference laboratories based in Charlesville, Margibi in Liberia under the Integrated Disease Surveillance and Response (IDSR) System. At the NRL, 30% of the staff are core lab technicians, 46% lab aides, and 24% lab assistants.

The Division of Public Health and Medical Research (DPHMR) is housed at the Charlesville campus and includes 91 acres with multiple research suites. DPHMR includes three research units in Microbiology, Parasitology and Vector Biology, and Nutritional Epidemiology; and have 13 scientific staff.

NPHIL has a strategic and an operational plan with support from the US Center for Disease Control (CDC), the World Health Organization (WHO) and the US National Institutes of Health (NIH).

NPHIL's Laboratory complex is located in Charlesville, Margibi County. Contained within the facility are two laboratories: the National Public Health Reference Lab and the Medical and Public Health Research lab. The reference lab is responsible for confirming surveillance samples for priority diseases in Liberia and has three sections, namely; molecular, serology and microbiology suites. The Public Health and Medical Research labs are involved with Ebola research in collaboration with the NIH/PREVAIL and studies in Malaria, AMR and Nutritional Epidemiology and also being conducted in these labs. NPHIL's laboratory complex hosts two BSL-2 suites and a BSL-3 lab is currently being completed for work on MDR-TB and other level 3 risk pathogens. The complex is equipped with uninterrupted power supply from one 250 KVA generator and three backups (One 220KVA and two 155 KVA).

Significant equipment at the NPHIL facilities include ELISA plate readers and washers (2), light-cycler real-time quantitative PCR machines (2) conventional PCR

machines (2), GeneXpert Real-time PCR (6), CO_2 incubator (5), class II biosafety cabinets (6), Illumina MiSeq (1), liquid nitrogen (LN2) tanks (3) and a 30 liter per day LN2 generator. Other available equipment includes, gel electrophoresis equipment, conventional microscopes, table top centrifuges, microfuges, Autoclaves, Water distillers, refrigerators and freezers, Millipore Direct Q water purification system, weighing balances and PAPR equipment and chargers.
Trained and competent laboratory staff include seven junior scientists and eight laboratory technicians with proficiency in varying laboratory techniques such as PCR, RT-PCR, serology, blood processing and DNA/RNA extraction, DNA/RNA sequencing and Microbiology.

Liberia Chimpanzee Rescue and Protection
Liberia Chimpanzee Rescue and Protection (LCRP) is an NGO operating in Liberia with a US based 501c3 affiliate. LCRP is one of the leading animal welfare and conservation organizations in Liberia focused on protecting and conserving wildlife, primarily chimpanzees. LCRP has a staff of 22, mostly dedicated to chimpanzee care. One of the co-directors, Dr. James Desmond, DVM, MS, is a veterinarian specializing in great ape health and zoonotic disease research.

LCRP currently operates on the grounds of the National Public Health Institute of Liberia (NPHIL) and has an MOU with the Society for the Conservation of Nature of Liberia (SCNL) and close relationships with the other prominent conservation and public health NGOs operating in the country such as: Conservation, Fauna and Flora International, and Wild Chimpanzee Foundation. In addition, LCRP works very closely with several government entities such as the Forestry Development Authority, Ministry of Agriculture, and NPHIL.

LCRP has four vehicles that are capable of handling the difficult road conditions present in Liberia, several laptop computers, various medical supplies and equipment, and shares office space and facilities with SCNL in Monrovia.

Society for the Conservation of Nature of Liberia
The Society for the Conservation of Nature of Liberia (SCNL) is an accredited, non-governmental organization based in Monrovia, Liberia that serves as the oldest, most well respected, and important civil service organization devoted to the environment and conservation in Liberia. With over 50+ staff based in the office and in the field, SCNL has had an enormous impact, and has been the driving force behind many conservation efforts in the country.

SCNL partners with numerous international NGO's including the Wild Chimpanzee Foundation, Conservation International, Fauna and Flora International, Liberia Chimpanzee Rescue and Protection, Rainforest Trust, EcoHealth Alliance, World Resources Institute and Birdlife International. SCNL's experience as the implementing partner of PREDICT Liberia has placed the organization at the forefront of a new paradigm within the public health sector in Liberia. In the post-Ebola environment, Liberia has adopted a One Health approach to public health and

because SCNL has played such an important role in operationalizing and promoting this new paradigm, the organization has positioned itself as a leader in the field.

Society for the Conservation of Nature of Liberia (SCNL) is equipped with the necessary equipment and facilities to conduct fieldwork throughout Liberia. Located in Congo Town a suburb of Monrovia, SCNL has easy access to vendors in order to procure supplies. SCNL has several 4WD vehicles able to handle Liberia's rough terrain. SCNL is equipped with 4 Stirling Ultracold portable -86°C freezers, 2 dry shippers to maintain cold chain, 3 mobile centrifuges for use in the field, various sized mist nets, 2 harp traps for catching bats, and a label printer for labeling cryovials. SCNL also has a warehouse built from a converted shipping container and other basic equipment needed to conduct proper field work.

University of Nebraska Medical Center, Omaha, Nebraska, USA
The University of Nebraska Medical Center (UNMC) is a vital enterprise in the nation's heartland and has mission to improve the future of health care in Nebraska and beyond. As Nebraska's only public academic health sciences center, UNMC is committed to the education of a 21st century health care work force, to finding cures and treatments for devastating diseases, to providing the best care for patients, and to serving our state and its communities through award-winning outreach. UNMC is one of four campuses that make up the University of Nebraska system. UNMC has six colleges, two institutes and a graduate studies program, serving nearly 4,000 students in more than two dozen programs. No laboratory research for this project will occur at UNMC; project datasets accessed from UNMC computers will be password protected and secure connections such as VPN will be used when accessing the data from off-site.

The recently established UNMC Global Center for Health Security (GCHS) is one of the nation's primary biosecurity resources for training, education, research, and clinical care. The Center has become the focal point of state, national and international collaborations having created a spectrum of biosecurity and biodefense services to help prepare for natural and man-made disasters. The network of experts helps to advance the coordinated, interdisciplinary development of new research and clinical practice and to disseminate innovative approaches to keep communities safe from epidemics and to counter weapons of mass destruction.

UNMC The GCHS provides a unique platform for health system preparedness, awareness, recognition, and response for public health and hospital emergencies. With a comprehensive capability in research, education & training, and health system operations, we strive to facilitate 21st-century care for public health emergencies in all environments. Below are some of the centers and initiatives that fall under GCHS:

- Nebraska Biocontainment Unit (NBU). A collaborative project involving the University of Nebraska Medical Center & Nebraska Medicine (UNMC/NM), as well as the Nebraska Department of Health and Human Services
- National Training, Simulation and Quarantine Center (TSQC). Selected as the National Training, Simulation, and Quarantine Center in 2017. This $20 million

HHS-funded capability will be home to the National Disaster Medical System & CStars ID training programs, and includes

- Nebraska Drug Development Pipeline. Collaboration among the Department of Defense, the National Strategic Research Institute (NSRI), the University of Nebraska-Lincoln, UNMC, and the pharmaceutical industry to develop new therapeutics and radiation countermeasures, products not currently prioritized for development.
- Nebraska Mobile Genomics Unit. Able to respond to a public health emergency by providing genomic characterization of the pathogen at the site of the outbreak.
- U.S. Air Force Center for the Sustainment of Trauma and Rediness Skills (C-STARS). First C-STARS infectious disease program dedicated to developing protocols, best practices, and training for USAF medical personnel in the care and transport of individuals with active or suspected HCI

Georgetown University, Washington, DC, USA
The Georgetown University Medical Center (GUMC) consists of a nationally-ranked School of Medicine (SOM), School of Nursing & Health Studies (NHS), Lombardi Comprehensive Cancer Center (LCCC), and Biomedical Graduate Research Organization (BGRO). GUMC is home to more than 400 basic and clinical research scientists, and 300 active clinical trials. Clinical care is provided at Medstar Georgetown University Hospital (MGUH) and satellite clinics through a partnership with MedStar Health, Inc. The Georgetown University Medical Center is the largest and most prominent Catholic medical center in the country.

All research staff at Georgetown University have exclusive use of PC-based desktop computers with extended RAM, significant GB hard disk space, dual-color flat-panel LCD monitors, and high-speed HP laser printers. Investigators will also have access to exclusive access to Macbook Pro or Dell laptops. Available software for desktop and laptop computers used for the project includes WINDOWS and Mac operating systems, MS-Office 2010, SPSS 20.0, and SAS 9.3. Study personnel will have full Internet and e-mail access; will be networked to shared, secure drives for data access; and will have full communication capabilities through the use of phone, fax, and email. GUMC provides complete hardware, software, and network support through its University Information Systems department. Box is also available for secure storage and access of files and folders on the Internet enabling the user to access files from any available computer with a web browser and Internet connection. All study investigators have secured private offices and study personnel also have office space. All investigators have access to conference rooms with video and teleconferencing equipment.

Dr. Standley has completed on-line certification from the IRB and NIH related to protection of human subjects in research. Georgetown University Policy on Protection of Research Data Standard operating procedures regarding data protection and patient confidentiality have been adopted throughout the institution. Office spaces, databases, and e-mail usage all have specific security requirements. The University and Medical

Center recently launched a new effort regarding protection of patient data. Dr. Standley and other members of the research team will attend relevant seminars/trainings.

Biostatistics & Bioinformatics Shared Resource (BBSR) provides basic, translational, clinical and population science investigators with access to high quality statistical science and informatics. BBSR functions include: study design; statistical analysis and reporting of research studies including clinical trials, studies with high dimensional "omics" and imaging data including pathway analysis; review and monitoring of clinical protocols through membership on the Protocol Review and Monitoring System and Data and Safety Monitoring Committees; and provision of biostatistics and informatics training and expertise in the collection, integration, management, and application of biomedical data. In addition, the BBSR provides investigators with advanced statistical and bioinformatics methods and expertise developed independently by BBSR faculty. The BBSR has excellent computing resources, informatics systems, and informatics and statistical software necessary for efficient and effective support of research. BBSR supports the development of the information architecture for connecting data and metadata from clinical, biospecimen, and research systems to enable all forms of research.

4. PLANNED WORKSHOPS: TOPIC, IMPLEMENTER, AND TIMELINE

All trainings to be conducted in Monrovia, Liberia or at field sites in Liberia.

Description	Lead	Timeline
Workshop 1a: All participants **Overall study protocol** *Half-day review of entire research design and anticipated outputs during kick-off meeting* • Overall research study protocol	Billy Karesh/ Ellen Carlin (EHA)	At Kickoff
Workshop 2a: Task 2 personnel, Task 4 personnel, students **Human subjects** *Two-day didactic workshop targeted to all personnel engaged with human subjects at clinical and field study sites and others who will handle human data* • Overview of human study protocol and project aims • IRB/human subjects research protocol • Ethical considerations and practices for conducting human research • Recruitment, consent, and enrollment of human subjects • Patient questionnaire and administration • Community safety during sample collection • Ethical practices for storing and conducting human research data and analysis • Transport protocol	Emily Hagan (EHA) James Desmond (LCRP)	Mid Y1 End Y3
Workshop 3a: Task 3 personnel, students **Biosafety and biosecurity**	Michael Wiley (UNMC)	At kickoff Mid Y1

One-day didactic and hands-on workshop in adherence to core principles and requirements for safe and secure sample handling and management (based on written DTRA requirements and BMBL 5th Edition Sections III-VI) • Biosafety and biosecurity • Sample storage and disposition		Y3 refresh
Workshop 3b: Task 3 personnel, students **Laboratory techniques** *Four-day didactic and hands-on intensive training in multiplex real-time PCR, and refresher training on singleplex PCR and ELISA serology* • real-time PCR testing and analysis • NGS testing and analysis • Serology testing and analysis	Michael Wiley (UNMC)	At kickoff Mid Y1 Y3 refresh
Workshop 4a: Task 4 personnel, students **Animal subjects** *Two-day didactic and hand-on training in ethics in animal research, personal protection during animal and sample handling, and storage and transport requirements* • Overall animal study protocol • IACUC/animal subjects research • Personal protective equipment • Transport protocol	James Desmond (LCRP)/ Ellen Carlin (EHA)	At Kickoff Y3 refresh
Workshop 5a: Task 3 and other interested personnel **Lab data analytics** *Three-day training workshop for results interpretation from all diagnostic testing modes used in project protocol* • Results interpretation • Bioinformatics	Michael Wiley (UNMC)	Y2
Workshop 6a: All personnel, other invited ministries relevant to risk and impact management **Risk reduction** *Four-day stakeholder workshop, especially those working on publications and policy and program implementation, to focus on analyzing project data and designing risk reduction and reporting changes* • Questionnaire and diagnostic data analysis (statistical methods, data analysis, and interpretation) • Reporting (national and international) • Economic analysis • Risk reduction strategies	Catherine Machalaba (EHA)	OY2

Annual training timeline:

Trainings	**Y1**	**Y2**	**Y3**	**OY1**	**OY2**
Workshop 1a: Overall study protocol					
Workshop 2a: Human subjects					
Workshop 3a: Biosafety and biosecurity	2x				
Workshop 3b: Lab techniques	2x				
Workshop 4a: Animal subjects	2x				
Workshop 5a: Lab data analytics					
Workshop 6a: Risk reduction					

5. FOREIGN PI AND KEY PERSONNEL LETTERS OF COLLABORATION

See next page.

National Public Health Institute Of Liberia

Preventing and Controlling Public Health Threats

Office of the Deputy Director General
for Technical Services
Ref. No:NPHIL/RL/MPF-DDGT/088/'19

July 23, 2019

To: DTRA C-WMD Thrust Area 6 Program

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

I strongly support this project. It is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience directing and overseeing the National Public Health Reference Laboratory and the Public Health Diagnostics and Research Laboratory in Liberia are directly relevant to the project objectives.
My academic and professional background in epidemiology, bio surveillance, case management and community mobilization equip me with both the technical skills and contextual perspective needed to ensure that this project meets mutual goals for Liberia and for the U.S. funder.
My oversight will make certain that all of the research being undertaken in the field and in NPHIL's laboratories meet Liberia's specific priorities for research and capacity building.

I am looking forward to being co-Principal Investigator and ensuring a successful outcome for the project.

Best regards,

Mosoka P. Fallah, PhD, MPH, MA

P.O. Box 1871, Emergency Operations Center, Congo Town Back Road, 1000 Monrovia, 10 Liberia

Society for the Conservation of Nature of Liberia (SCNL)

Birdlife Partner

Tubman Boulevard, Congo Town, CARE Compound

P.O. Box 2628 Monrovia, Liberia, West Africa

(+231) 886-573-612/0777544611

Website: www.scnlliberia.org

E-mail: scnlliberia@yahoo.com

Michael Garbo
Executive Director
Society for Conservation of Nature of Liberia
Congo Town, Monrovia

July 23, 2019

To: DTRA C-WMD Thrust Area 6 Program

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

I strongly support this project. It is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience as Executive Director of the Society of Conservation of Nature of Liberia is directly relevant to the project objectives. My experience overseeing and implementing multiple conservation projects and most recently the USAID funded PREDICT project provides me with the requisite experience to ensure the project meets the goals set forth in the proposal. My involvement will ensure that the wildlife surveillance component of this project will be professionally executed in the field and financially.

Sincerely yours,

Mr. Michael F. Garbo
Executive Director/SCNL

Liberia Chimpanzee Rescue and Protection
rescuing chimpanzees in need to keep wild chimps wild

July 24, 2019

To: DTRA C-WMD Thrust Area 6 Program

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

I strongly support this project. It is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

As the Country Coordinator of PREDICT Liberia and over a decade conducting fieldwork around the world on zoonotic disease surveillance, my experience is directly relevant to the aims of this project. As the Co-Director of Liberia Chimpanzee Rescue and Protection as well as a consultant for many international conservation and public health I have a great deal of experience overseeing and implementing successful zoonotic disease surveillance projects in wild animal and domestic animal populations under a variety of settings and cultures. Having resided in Liberia for the past four years, I have built strong professional relationships with most of the principals involved in this project and have a very good understanding of Liberia's public health landscape. LCRP's involvement will ensure successful implementation and execution of this project.

Sincerely,

Dr. James S. Desmond DVM, MS
Co-Director, Liberia Chimpanzee Rescue and Protection

University of Nebraska Medical Center

COLLEGE OF PUBLIC HEALTH
Department of Environmental, Agricultural
and Occupational Health

July 17, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Michael Wiley

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

I strongly support this project. It is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience with setting up a genomics laboratory in Liberia and preforming sequencing activities at the Liberian Institute for Biomedical Research is directly relevant to the project objectives. I feel my skill set and expertise complements the work being purposed and very excited to be included.

Sincerely,

Michael Wiley
Department of Environmental, Agricultural and Occupational Health
College of Public Health
University of Nebraska Medical Center

984388 Nebraska Medical Center / Omaha, NE 68198-4388
402-559-8924 / FAX 402-559-7259 / www.unmc.edu/publichealth/

GEORGETOWN UNIVERSITY
Georgetown University Medical Center
Center for Global Health Science and Security

July 16, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Claire J. Standley, PhD

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

I strongly support this project. It is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

Georgetown University is a leading academic and research institution in the USA, with multiple schools and departments contributing to a strong cross-campus research agenda that encompasses various aspects of public health and migration. The Center for Global Health Science and Security consists of a multi-disciplinary team that focuses on research to support capacity building for preparedness and response to public health emergencies and expertise in translating public health evidence into actionable policies and practices for decision-makers.

My own experience with health systems strengthening, with an emphasis on prevention and control of infectious disease in both humans and animals is directly relevant to the project objectives of building Liberian capacity for high consequence zoonotic pathogen surveillance associated with human acute febrile illness. I have extensive experience in international capacity building for public health and One Health efforts.

Sincerely,

Claire J. Standley, PhD
Assistant Research Professor
Center for Global Health Science and Security
Georgetown University

REPUBLIC OF LIBERIA
MINISTRY OF HEALTH
P. O. BOX 10-9009
1000 MONROVIA 10, LIBERIA
WEST AFRICA

Office of the Deputy
Minister for Planning
Research & Human Development
Ref. No.:

MOH/GOL/AVT-DMP/786/*19

July 24, 2019

To: DTRA C-WMD Thrust Area 6 Program

From: Ministry of Health, RL

This letter signifies the Libera's Ministry of Health commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia.*

The Ministry of Health pledged her support to this project which is designed to build on significant investment already underway in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. This initiative will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

The Ministry of Health will work with the National Public Health Institute of Liberia (NPHIL) on this project via a memorandum of understanding to implement the human clinical element of the present study by providing personnel to execute the study protocol at county hospitals. For the first three years, the study sites will be Redemption Hospital in Monrovia (a public hospital) and Phebe Hospital in Bong (a private hospital that received public funding from our ministry).

Sincerely,

A. Vaifee Tulay
Deputy Health Minister for Policy Planning, Research and M&

nurses empowering nurses worldwide

July 17, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Nursing for All

This letter signifies my commitment to support the proposal, *Reducing the threat from high-risk pathogens causing febrile illness in Liberia*.

Nursing for All (NFA) strongly supports this project as relevant to the health needs of Liberia itself and the surrounding region. The project effectively leverages work that has already been accomplished in Liberia to augment country capacity for surveillance, detection, and reporting of infectious diseases. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced to prevent the next Ebola crisis. The project is highly likely to advance that goal, while furthering our knowledge of zoonotic infectious diseases of epidemic potential.

NFA's six years of experience with nurse capacity development in Liberia will be germane to this project as we assist in training and coordinating hospital personnel to collect the samples this project needs. NFA has operated in Nimba County since our inception and is delighted to support a project so relevant to the concerns of nurses currently practicing in that county.

Sincerely,

Laura Jean Ridge, ANP-BC, AAHIVE
Founder
Nursing for All

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6. GUIDELINES AND PROTCOLS FOR HUMAN AND ANIMAL SUBJECTS RESEARCH

For human subjects research, our protocols will align with PREDICT protocols with which our in-country teams have been complying for four years. They will be modified to reference the specifics of this project's IRB (as opposed to PREDICT's IRB).

- 5.4 Human Syndromic Surveillance (see next page)

USAID | PREDICT

Section 5.4. Human Syndromic Surveillance

Prepared by
Christine K Johnson, PREDICT Biological and Ecological Surveillance Lead, UC Davis
Karen Saylors, PREDICT Behavioral Surveillance Co-Lead, Metabiota
Corina Monagin, Metabiota

With contributions from:
Maureen Miller PREDICT Behavioral Surveillance Lead
Jason Euren, Metabiota
Ashley Lucas, Metabiota
Nicole Ureda, UC Davis
Kim Dodd, Metabiota
Brian Bird, UC Davis
David Wolking, PREDICT Operations Officer
Tracey Goldstein, PREDICT Pathogen Discovery Lead
and the PREDICT One Health Consortium

Objectives: To safely and ethically collect biological samples and data from humans in clinical settings.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

The authors assert that human surveillance and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Human Syndromic Surveillance

Table of Contents: Human Syndromic Surveillance

Planning Syndromic Surveillance

Procedures for Patients in Hospitals and Clinics

References and Appendices

Section 5.4.1. Confirmation of Knowledge

When you are familiar with the information in this guide, take the PREDICT quiz ***Section 8.4.12. Human Syndromic Surveillance***.

PREDICT team members involved in the human surveillance activities described in this guide must be familiar with PREDICT's Institutional Review Board (IRB)-approved Master Protocol and related IRB obligations and should take and pass the quiz ***Section 8.4.18. PREDICT IRB Compliance and Monitoring***.

Section 5.4.2. Ethical and Training Considerations

All PREDICT activities involving human subjects must adhere to the most up-to-date version of the Master Protocol that has been approved by the UC Davis Institutional Review Board (IRB). The Master Protocol is available online through the PREDICT Operating Procedures e-Book under "Section 5.3" (https://eidith.org/Resources/PREDICTOperatingProcedureseBook.aspx). In addition, PREDICT activities involving human subjects may only be initiated after obtaining ethical approval from country institutional review boards.

Before implementing human subjects research related activities, documentation of all necessary country approvals along with attestations of trainings and adherence to ethical standards must be provided for review to UCD, and the UCD IRB as appropriate. These include

1) documentation of local IRB/ethical approvals and all approved documents (including the consent form and human questionnaire translated into the local language and any additional introduction letters and recruitment scripts planned for use);
2) completion of CITI training for all personnel listed on the country protocol (with training events documented in EIDITH);
3) training of project staff in procedures outlined in this SOP (with training events documented in EIDITH);
4) identification and documentation of local institutional biosafety committee (IBC) requirements (if any);
5) a consultation from a local expert summarizing risks to the area; and
6) an attestation that all personnel will adhere to USA and local government federal and state regulations regarding protection of human subjects research.

A checklist with both country IRB preparation guidance and post country IRB approval procedures relating to UC Davis IRB authorization has been created to assist country teams with this process (Appendix 1). Please review this checklist when preparing your application for

country IRB submission and to guide the final UCD IRB authorization process following local IRB approval. **The UC Davis IRB must approve each country's protocol before local activities are initiated.**

Effort will be made in all recruitment, consent, sampling, and interview activities to assure potential participants that their **participation in the study is completely voluntary** and that all information shared with researchers will be kept confidential. Every effort will be made to avoid coercion and ensure the privacy, respect, dignity, and freedom of each participant.

PREDICT staff named on the country protocol must complete Collaborative Institutional Training Initiative (CITI) training in human research ethics for biomedical researchers. In addition, PREDICT staff listed in the country protocol will need to ensure proper training of hospital/clinic POC(s) in study procedures, including recruitment, enrollment, informed consent, and sample collection, to ensure compliance with our Master IRB protocol and PREDICT practices.

When the staffing and implementation plans have been established, a plan should be developed to train clinic and hospital staff on protocol procedures to ensure implementation of agreed upon study design. Consideration should be given to how information will be presented, as not every facility staff member will need to know every detail of the PREDICT plan.

Section 5.4.3. Partnerships with Participating Health Facilities

Symptomatic patients will be recruited for syndromic surveillance in collaborating health facilities that have a catchment area that includes high-risk communities and PREDICT field sites where linked animal and human samples are being collected concurrently.

Syndromic surveillance of patients presenting to health facilities is necessary to identify symptomatic individuals. In order to optimize the chances of accessing the most relevant acute symptomatic individuals presenting at health facilities, appropriate selection and engagement of health facilities is key. While each individual site will require a slightly different approach, teams can be guided by the following methodology when looking to engage and maintain relationships with their sites in each country.

Assessment of the Health Facility

After initial engagement with key personnel, teams will need to work collaboratively with health facility personnel to consider the most optimal way to engage with clinical, laboratory and professional staff. A short form to assist with initial assessment of potential partners for syndromic surveillance is attached in Appendix 2 (Health Facility Screening Form).

Understanding Patient Flow

A thorough review of patient flow from arrival at the facility to discharge should be done by country teams through scoping site visits including:

- Where do patients normally present upon arrival to the facility and who would they first come into contact with for initial screening and assessment?
- What health professionals would potentially be involved in the assessment, diagnosis and treatment of individuals presenting with syndromes of interest throughout their stay at the health facility?
- If patients are not admitted to a health facility but might require follow-up care, what are the normal follow-up and discharge procedures?
- If patients are admitted to the health facility, what service units/departments might be involved in their care and treatment?

Understanding Staffing Needs

Understanding normal daily routine of staff and diagnostic practices, and identifying point of contact(s) (POC), will ensure that PREDICT procedures fit in as seamlessly as possible into the normal clinic routine.

- What is staff workload like?
- Who is your POC(s) to help identify symptomatic individuals?
- Who is your POC(s) for recruitment of appropriate individuals?
- Who may be best suited for assisting with study procedures, including sample collection and administration of questionnaire?
- Are these POC(s) likely to be the same person or different?
- What will be the best way to engage and train staff about study procedures and protocol?
- Are clinical staff skilled in proposed sampling procedures?
- How will costs for staff time at hospitals be covered and implemented?

The team should identify how PREDICT activities will fit into hospital workflow and develop an implementation plan that will need to be agreed upon with the hospital team. Decisions will need to be made about whether current hospital staff will be assigned additional duties or whether a new staff person(s) will be hired.

A detailed implementation plan, taking into consideration the following issues, should be developed with participating hospital staff:

- What are some potential barriers to implementation?
- What level of visibility and follow-up will be appropriate to keep sites engaged for the duration of the study?
- How will you maintain clear and open communication with health facility staff?
- What is the plan if key personnel involved in implementation leave the health facility?
- How will you take into consideration any known or observed differences religious/ethnic/immigration status in targeting individuals for recruitment?
- How will you monitor for adverse events?

Section 5.4.4. Patient Recruitment in Hospitals and Clinics

PREDICT targets patients that have been recently admitted to clinics and hospitals with acute conditions that match the case definitions for undiagnosed febrile syndromes of likely viral origin. **The objective of PREDICT's testing strategy is to detect novel viruses that are causing diseases in patients without a known etiology.** PREDICT testing should not overlap or duplicate diagnostic testing already being conducted at the hospital.
In communications with clinic medical staff, clinic administration and patients who might be enrolled, it is critical to note that **PREDICT's testing strategy will not directly inform on patient diagnoses or treatment. Our testing strategy is exploratory at the community level and not designed as a point of care diagnostic platform for normative (known) diseases.**
Case definitions should be reviewed closely with hospital POC(s) in advance of study implementation to identify patients for enrollment. Patients for enrollment may be identified in the emergency room, in the ward, or in the intensive care unit of each participating clinic and hospital. The POC(s) at each location should use the **clinical case definitions below** to target potential participants. Case definitions for syndromes have been standardized with those commonly used by WHO and CDC to allow national health authorities to interpret data in an international context.

Syndromic Category Clinical Case Definitions

Surveillance should be designed to target specific syndromes as appropriate in each clinical setting. Identification of relevant syndromes for each facility should be done on a facility-by-facility basis with participating partners and facility staff. Selected syndromes should reflect 1) high priority undiagnosed syndromes with likely animal origins, and 2) the clinical caseload of the hospital or clinic so that a large number of patients with targeted syndromes can be enrolled. Additionally, targeted syndromes should take into account local needs and seek to not duplicate ongoing syndromic surveillance programs by other partners at the clinic or hospital.

In larger referral hospitals with high caseloads, enrollment of patients in the PREDICT study will most likely want to focus on the following three severe syndromes and clinical case definitions to better target individuals with potentially unknown viral pathogens of concern:

1. **Severe Acute Respiratory Illness (SARI) of unknown origin:**
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days
AND cough
AND requires hospitalization (or referral to a hospital)
AND absence of a more likely clinical explanation.

2. **Acute Encephalitis Syndrome (AES) of unknown origin:**
Acute onset of a fever (greater than or equal to 38°C or 100.4 °F) within the last 5 days
AND clinical signs consistent with meningitis, encephalitis, acute flaccid paralysis, or other

acute signs of central or peripheral neurologic dysfunction, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

3. **Hemorrhagic fever of unknown origin:**
Acute onset illness with a fever greater than or equal to 38°C (100.4 °F) within the last 5 days in a severely ill patient
AND clinical findings of bleeding or hemorrhage with no apparent cause
AND one or more of the following clinical findings: 1) severe headache, 2) muscle pain, 3) rash on the trunk within 3–4 days after rash onset, 4) vomiting, 5) diarrhea, 6) abdominal pain, or 7) pharyngitis, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

See also http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=893&DatePub=2010-01-01

In smaller rural clinics, with limited diagnostic capabilities and lower patient caseloads, it may be appropriate to enroll a broader range of patients with suspected illness of unknown origin. In these circumstances, the following 2 clinical case definitions, for less severe and less specific syndromes, may be appropriate to target in addition to the severe syndromes targeted above.

4. **Fever of Unknown Origin (FUO):**
A temperature greater than or equal to 38°C (100.4 °F) for more than 24 hours as reported or measured by the patient or a health-care provider
AND absence of a more likely clinical explanation or failure to reach a diagnosis.

5. **Influenza-like Illness (ILI) of unknown origin**:
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days.
AND cough
AND absence of a more likely clinical explanation.

Be sure to follow the most up-to-date version of the PREDICT Master IRB protocol with respect to all procedures, including recruitment, enrollment, inclusion, and exclusion criteria, and sample sizes.

Additional Enrollment Criteria and Considerations

PREDICT and hospital/clinic staff must take special care to ensure that patient recruitment and enrollment is not adversely impacting patients seeking medical care, or hindering patients' ability or willingness to seek medical care in any way. Recruitment and enrollment of patients should only occur after patients have established access to health services. Patient recruitment for this study should not be linked to patient intake or admission. Enrollment must be completely voluntary.

Eligible individuals should be recruited as soon as safely possible after presentation to the health facility, and after initial screening to ascertain whether patients meet the above clinical case definition, in order to maximize the utility of the biologic specimen collected. Successful recruitment of syndromic individuals will require monitoring of incoming patients to health facilities. Recruitment from health facilities involves many coordinated steps, involving coordination between PREDICT and health facility staff.

In addition to the clinical case syndromes identified above, inclusion and exclusion criteria outlined in the approved Master IRB protocol that must be applied to all PREDICT studies is reiterated below:

Additional Inclusion Criteria	***Exclusion Criteria***
1. Adults (18 years of age or greater) who provide informed consent	1. Individuals aged 18 years or older who refuse to provide informed consent, a parent or guardian of a child who refuses to provide consent on behalf of their child, or a child 12 years or older unable or unwilling to provide assent
2. Children (2 -17 years of age) * with an accompanying parent or guardian who is able to provide informed consent. Assent of children 12 years or older also required.	2. Adults unable to provide informed consent, including individuals with physiologically or medically induced cognitive impairments. **
3. Pregnant women	3. Children without an accompanying parent or guardian who is able to provide informed consent
	4. Children < 2 year of age
	5. Prisoners

**Children defined as 2-17 years unless the age of majority in a participating country differs. In these cases, the age range for children will be listed in the country specific IRB protocols.*

***Patients who are incapacitated and unable to provide informed consent may be enrolled if an appropriate patient representative (e.g., family member) is present, willing, and able to provide consent on the patient's behalf. If, in the course of study operations, such a patient become capable of providing informed consent, the patient will be directly consented.*

Section 5.4.5. Determining the Number of Patients to Enroll in Clinical Settings

Estimated sample sizes of patients approved in the Master IRB is a maximum of 1,620 in each country for syndromic surveillance activities over the course of the project. Any deviations from this total estimate will need to be reviewed and authorized by the UCD IRB (See Section 5.8.1b).

Patients meeting targeted case definitions should be enrolled systematically across the year so that the patient population is sampled across all relevant seasons. Monthly sample sizes throughout the year should reflect a consistent proportion of patients meeting targeted case definitions.

In general, patients should be enrolled using a quota system until approximately 20% of the participants are children < 18 years of age and 80% are adult. For larger hospitals and clinics, interval sampling will be implemented by selecting every N^{th} case at the site among those individuals who meet enrollment criteria. The interval should be determined by country teams based on an evaluation of the expected number of cases presenting at the site within a given year in order to best meet study design and sample size criteria. For example, in a large hospital with many patients meeting enrollment criteria, the first patient meeting criteria would be selected for study participation followed by selection of every 3^{rd} or 5^{th} individual (depending on the appropriate interval) until the maximum sample size is obtained.

Procedures for Patients in Hospitals and Clinics

Section 5.4.6. Overview of Procedures in Hospitals and Clinics

PREDICT and hospital/clinic staff should consider and make arrangements to conduct the following steps. These steps may need to be adjusted depending on the circumstances of each enrolled health facility. An overview is summarized below for ease of use in training PREDICT staff. Details for each procedure are described further below and in the IRB protocol.

Outline of Activities Involving Patients:

1. **Patient Triage and Intake**: Patients arrive at health facilities and present to patient triage and/or intake units. Clinic or hospital POC(S) will assess patient etiology as part of their normal routine. Following patient triage and intake, patients with presenting syndromes of interest will need to be actively referred to PREDICT POC(s). This active referral will deviate from the health facility staff's normal routine. Country coordinators will need to establish a protocol with the health facility staff prior to beginning recruitment and *ensure that this process does not negatively impact patient access to health services, or health facility workflow*.

2. **Administer Informed Consent**: Patients determined eligible via the Screening Form will be offered participation in PREDICT. Study staff will administer the informed consent form to interested patients. *No study procedures can be conducted without having first obtained informed consent.* Informed consent must happen in a private space and should not involve anyone other than research staff, the patient, a representative if the patient is incapacitated, an impartial witness if the participant is illiterate, and a

parent/guardian if the patient is a child. Once consented, the patient is considered an enrolled participant.

Note: The presence of clinical staff directly involved in patients' care during the consenting process should be construed as coercive. Patients may think they need to consent in order to continue receiving care. PARTICIPATION MUST BE STRICTLY VOLUNTARY.

3. **Collect PREDICT Specimens**: Once enrolled, PREDICT POC(s) will coordinate human biologic specimen collection. Samples may be taken concurrently when collecting samples for normative diagnostics or independently.

4. **Administer Human Questionnaire**: Study staff will administer the **standardized IRB approved human questionnaire to all enrolled participants** at a point in time that ensures patient privacy and is not disruptive to patient care. The human questionnaire must be administered to all patients from which a biologic specimen is collected.

   In clinical settings with critically ill patients, the full human questionnaire may not be possible or appropriate to administer. At a minimum, the "**Core Human Questionnaire" (pages 1-6 of Human Questionnaire)** and the **Human Hospital & Clinic Module** for Patients should be completed.

5. **Normative Diagnostics**: Throughout a patient's inpatient stay, a variety of normative diagnostics, if available, might be run by the health facility staff to determine patient etiology. If additional sampling procedures are conducted as part of normative diagnotics that do not overlap with PREDICT specimen types already collected, PREDICT may request that any unused or remaining diagnostic specimen types be saved from patients enrolled in the PREDICT study (such as cerebral spinal fluid, pleural fluid, etc) to expand the sample set for PREDICT testing.

   Once health facility staff obtain diagnostic results, patients' etiologies will be updated. This information can be used to prioritize samples for testing with PREDICT viral family protocols. If an etiology for fever or clinical syndromes is identified, samples from this patient are of lower priority, unless a novel viral infection is still suspected because the objective of PREDICT's testing strategy is to detect novel viruses that are causing disease in patients. PREDICT POC(s) will need to follow the inpatient progress of enrolled participants to know when etiologies are updated.

6. **Second PREDICT Serum Specimen Collected**: 7 days after the first sample collection or later, an additional serum sample (the discharge serum) should be obtained from participants when possible.

Section 5.4.7. Administering Informed Consent

Participation of human subjects in the study will be strictly voluntary and will require signed, informed consent. All consent discussions and procedures will be conducted in a private room or location with a trained staff member fluent in the local language. Only the PREDICT staff person/POC and the patient will be present during the consent process. Additionally, the patient's representative if the participant is incapacitated, an impartial witness if the participant is illiterate, and/or the patient's parent or guardian if the patient is a child, can be present during the consent process. CITI-trained PREDICT staff may occasionally observe consent procedures to ensure they are appropriately and thoroughly conducted.

All participants will be given an information sheet and consent form prior to being asked to participate in this study. Potential participants will review the information sheet and consent form with the PREDICT POC(s) and will be given time to ask questions. During the review, POC(s) will explain details of the study, including:

- Purpose of the study,
- Why they were selected,
- What will happen if they enroll in the study,
- Potential risks due to their participation,
- How their participation is beneficial to understanding viral pathogens in the community,
- That their participation is completely voluntary,
- How they can withdraw their participation at any time,
- How participation in the study will not interfere with, nor affect, their routine medical care in the health facility,
- How PREDICT testing is exploratory research, and not diagnostic, and this will not inform on patient diagnosis or treatment.
- Test results, these will not be directly communicated back to the participant

PREDICT Study staff POC(s) will review the consent form with participants, answering any questions participants have. It should be made clear to all participants that any data or information collected will be kept strictly confidential. Measures will be taken to ensure the respect, dignity, freedom, and privacy of each participant. PREDICT POC(s) involved in the enrollment and recruitment of participants must avoid coercion of any kind. The PREDICT representative conducting informed consent procedures will not enroll the participant in the study unless confident that the participant or his or her representative fully understands the study and all potential associated risks and benefits.

After reviewing the forms and discussing the study, individuals who agree to participate will sign and date two copies of the consent form, and the staff member conducting the consent discussion will also sign and date the consent forms. If the participant is a child, he or she will

be asked to provide assent to participate in the study and the patient's parent or guardian will sign and date the consent forms. If the patient is illiterate, the witness will sign and date two consent forms. If the patient is incapacitated, his or her representative will sign and date the consent forms. The patient will be given a copy of all consent documents.

Section 5.4.8. Brief Overview of PPE

Minimum PPE Required for Safe Human Specimen Collection
The minimum PPE used by healthcare professionals for human sampling should follow the CDC and other international guidelines for best practices and precautions.

The following are the minimum PPE requirements:

- Gloves
- Designated clothing (which may include gown, apron, long sleeve lab coat)
- Closed-toed shoes
- Eye protection (glasses or goggles), face mask or shield

(See the PREDICT ***Biosafety and PPE Guide (Section 4.1)*** for detailed instructions regarding PPE Use.)

Section 5.4.9. Collecting Clinical Specimens

Enrolled patients who satisfy inclusion criteria as described above (with signed consent form) will be asked to provide clinically relevant biological specimens based on clinical symptoms. To ensure patient privacy, no identifying information from patients will be stored with, or paired with, biological specimens or test results.

Patients should be enrolled with specimens and data collected within 3-5 days of onset of symptoms if possible, and not longer than 10 days after onset becase we are targeting viral etiologies. Critically, patients must have specimens collected as soon as possible after admission in order to ensure they are captured in the viremic phase and/or while they are still shedding the virus, if the illness turns out to be of viral origin. If feasible, hospitalized patients may have repeated serum samples collected at seven days after enrollment, or later before discharge.

Biological samples may only be collected by trained personnel certified by the country's authority for certification of medical professionals. All personnel collecting or handling PREDICT biological specimens must wear appropriate PPE and practice Universal Precaution procedures.

Study representatives should conduct activities in a secure location and a confidential

manner to ensure participant privacy. A barrier or private room should be utilized so that participants cannot be seen by outside observers while they are being sampled. During and immediately after sample collection, trained medical professionals and/or clinic staff will monitor specimen collection site(s) and treat any complications according to existing health facility protocols.

Summary of Clinical Specimen Types

The decisions about which specimens to collect should be based on the patient's clinical symptoms (eg. blood and oral/nasal swabs for respiratory patients;):

- 2 x Oral or Nasal or Oropharyngeal swabs - one in 500 µL VTM and one in 500 µL Trizol
- 2 x Whole blood samples - one with max of 500 µL of whole blood in 500 µL VTM and one with max of 500 µL of whole blood in 500 µL Trizol
- 2 x Serum samples - 2 x 500 µL aliquots, frozen without media
- 2 x Urogenital swab samples – one swab each in 500 µl VTM and 500 µl Trizol
  OR
  2 x Urine samples - one 500 µL urine sample each in 500 µL VTM and in 500 µL Trizol
- 2 x Rectal swabs - one swab in 500 µL VTM and one in 500 µL Trizol
  OR
  2 x Fecal samples - 0.5cc (pea size) feces in 500 µL VTM and 0.5cc (pea size) feces in 1 mL Trizol
- Additional samples or aliquots of specimens collected for standard normative diagnostic purposes by hospital staff may be requested, as appropriate and based on clinical symptoms (see below).

Whole Blood and Serum

Trained phlebotomists, doctors, or nurses will collect venous blood samples by standard venipuncture from the right or left antebrachium.

A minimum of two blood samples will be collected from each participant. Collect one sample into a vacutainer tube containing serum separator and the other into a vacutainer tube containing EDTA. For children aged 12 years or younger, collect a maximum of 6mL in each tube. From individuals aged 13 years and older, collect a maximum of 12mL per tube.

Ensure adherence to appropriate PPE while handling biological specimens.
Allow blood in the red top or serum separator tube to clot, then centrifuge. After clotting and centrifugation, aliquot a minimum of two (and up to four) 0.5 mL aliquots of serum into individual cryovials without Trizol or VTM.

From the EDTA lavender top tube, place up to 500 µL whole blood directly into 2 vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each vial well.

Samples will be frozen immediately in liquid nitrogen and then transferred to an ultralow (-80°C) freezer as soon as possible for storage until analysis.

Note that two blood sampling events are warranted if feasible in a hospital or clinic setting, one on the day of enrollment and one seven days after enrollment or later (before discharge), to collect a serum sample only. If serologic assays are available for use for targeted viruses, a rise in IgM with convalescence might assist in establishing causality with disease syndromes.

Oral, Nasal, or Oropharyngeal Swabs

Each patient may have duplicate oral, nasal, or oropharyngeal swabs collected on the day of enrollment to the study.

Oral and nasal swabs will be collected by applying a sterile, flexible, nylon-tipped swab to the appropriate tissue and gently rubbing for 2-5 seconds. Oropharyngeal swabs will be collected by medically trained personnel by gently inserting sterile, flexible, nylon-tipped swabs into the pharyngeal cavity for 2-5 seconds and rotating while removing, as is done for diagnostic procedures.

Place each swab into its own vial, one containing 500 µL VTM and one containing 500 µL of Trizol, mix each tube well, and freeze immediately.

Rectal Swab or Feces

Rectal swabs will be collected by gently inserting 2 sterile, flexible, nylon-tipped swabs into the anal canal, moving them from side to side, and rotating while removing. Place each swab into a vial, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

If patients are to provide a stool sample instead, they will be provided containers labeled with their individual ID number and instructions on how to collect an uncontaminated fecal sample, including appropriate guidelines for hand washing after sample collection.

Add 500 µL (a pea-sized piece) of feces directly into each of two vials, one containing 500 µL VTM and one containing 1ml Trizol. Mix each tube well and freeze immediately.

Urogenital Swab or Urine

A urine sample will be collected in a sterile universal container. Patients will be provided containers labeled with their unique ID numbers and instructions on how to collect an uncontaminated urine sample, including appropriate guidelines for hand washing after

sample collection.

Add up to 500 µL of urine directly into each of two vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each tube well and freeze immediately.

If urine can't be obtained, collect two urogenital swabs and place into two vials, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

Additional Samples

For hospitalized patients, PREDICT also may receive remnants or aliquots of appropriate clinical specimens that have already been collected for diagnostic purposes. PREDICT testing should be conducted on remaining sample aliquots only after standard diagnostic procedures have been completed to ensure PREDICT activities do not interfere with patient care. These samples may include urogenital swabs, cerebral spinal fluid (CSF), pericardial fluid, pleural fluid, ocular swabs, or others. PREDICT should collect these remnants or aliquots in keeping with the respective participant's clinical symptoms, for instance, pleural fluid would be sourced from participants with respiratory distress, CSF from participants with encephalitis, etc. These samples can be frozen at −80 °C without Trizol or VTM. If additional PREDICT analyses are done on hospital diagnostic screening samples, results will not be communicated to patients or participating health facilities.

Section 5.4.10. Medical History and Behavioral Risk Data Collection in Clinical Setting

All enrolled patients will complete the required elements of the ***Human Questionnaire*** and the ***Human Hospital and Clinic Module for Patients***. If appropriate given the clinical setting and patient condition, the full PREDICT Human Questionnaire with all relevant modules can be completed.[1]

Questionnaire data will be collected by trained staff in a strictly confidential manner. Individual interviews will be conducted in private with no other individuals within a 10-foot distance, ensuring that others cannot hear the interviews. A barrier will be created so that no other individuals can view the participant while they are in their interview. Staff will take care to pair interviewers and respondents by sex to ensure protection of women and children and privacy

[1] To access the Human Questionnaire and desired module bubble forms, log in to EIDITH at https://connect.eidith.org/. Click the "Download Bubble Forms" button and select "Human Questionnaire" under the Choose Type drop-down menu. Select the Questionnaire or module you wish to download, indicate the number of forms you would like, and press "Submit." When prompted to do so, click on the word "here" to download your form/s. Additional instructions for completing and uploading the forms may be found in the Videos and Instructions menus on the connect.EIDITH.org dashboard.

and confidentiality of responses. Children will not be interviewed in the absence of a parent or guardian.

As many questions are sensitive in nature, the presence of support persons may make it difficult for participants to feel comfortable answering questions honestly. PREDICT POC(s) should liaise with clinical staff and family members for critically ill participants, as appropriate, to determine the most patient-centered means of collecting sensitive data, while still maintaining the accuracy of the data collection methods.

Where participants are intubated and unable to communicate verbally, but alert and appropriately communicative, POC(s) may administer the human questionnaire using paper and pencil with participants, if possible. Where patients are sedated and/or comatose, a shortened version of the questionnaire may be completed with a family member or substitute decision maker, if deemed appropriate by all parties. The human questionnaire must be completed if a biologic specimen is drawn; therefore, if the POC(s) is unable to complete the questionnaire for any reason with a participant, they will be excluded from the study. In all instances, the decision to complete the human questionnaire with critically ill individuals must weigh the benefits and downsides with family/friends, clinical staff, and the research team. The POC(s) must also consider patient privacy in immobile or critically ill participants and deem if there is appropriate space in which to conduct the questionnaire to ensure privacy and confidentiality.

Participants may be given a small token of appreciation for participation in the study that is appropriate with local culture and customs and valued at no more than $10 USD. Local research teams will determine the most appropriate item to give as a token of gratitude to research participants. This item should be given to participants after consent and baseline sampling and interviews are complete.

Section 5.4.11. Record Maintenance and Ensuring Participant Privacy

A study participant log should be maintained at each site to track participant enrollment. Information on new participant enrollments should be added to the log in a timely fashion after their consent; the enrollment of pregnant women and children, in particular, should be noted. If, after signing a consent form, a participant decides that they wish to withdraw from study activities, this information must be recorded in the participant log. In addition, each site may wish to maintain a confidential linking log that links participant names to their unique identification number; this log should also be maintained in an up-to-date manner, with information on study enrollees added shortly after their consent. An example participant log is attached in Appendix III.

No identifying information from patients will be stored with or paired with questionnaire data, biological specimens, or analytical test results. Further, identifying information must not be stored electronically and must be stored securely in locked drawers or cabinets in areas accessible only by PREDICT staff. When questionnaires are moved to the country headquarters,

they will contain only coded data to ensure the safety and confidentiality of participants and will be maintained in a secure database. The only document that will link the participant with a unique ID number is the consent form, which will be stored in a locked file separately from participant data in the offices of the Country Coordinator.

Section 5.4.12. Reporting Results

The PREDICT team will inform collaborating partners of the aggregate patient test and behavioral risk findings as well as provide information about viral detection and zoonotic diseases detected, as appropriate. One key benefit of this study to participating clinics and hospitals is to enhance understanding of viruses that could be causing syndromes in local people but that have previously gone undiagnosed. This information will inform participating clinics and hospitals about viruses common in target patient communities and may lead to practices that could reduce exposure and health risks.

Report summaries of interpreted data generated from the project will be provided to the Ministry of Health for approval for release. Following approval for release, report summaries from the project can be shared with other in-country collaborating investigators and hospitals. Adverse events or serious adverse events will be included in report summaries provided to Ministries of Health upon request.

Section 5.4.13. Protocol Deviations, Unanticipated Problems, and Adverse Events

For complete information on protocol deviations, unanticipated problems, and adverse events, see the PREDICT Compliance and Monitoring Guide.

Protocol Deviations
Country teams and hospital and clinic POCs responsible for conducting PREDICT surveillance activities must be familiar with PREDICT's IRB protocols and knowledgeable about expected human surveillance operations. If, during the course of study activities, a team member becomes aware that any human surveillance activities have not been conducted in accordance with protocols or training guides, the team member should promptly inform the country field coordinator/human surveillance officer (if one is active in the country) or Country Coordinator about the deviation. The Country Coordinator should promptly contact the regional lead and complete any documentation, including developing any Corrective and Protective Action plans.

Unanticipated Problems
Unanticipated problems are events that are **unexpected** and **related to the research study** and that put one or more study participants at **greater risk of harm**. Unanticipated problems can include events or issues arising during standard research operations that may not cause detectable harm or adverse effects to research participants, but nonetheless raise the level of

risk associated with research participation (e.g., stolen consent forms or linking logs; breaches of privacy during research interviews). All problems meeting the three criteria above must be reported to the Operations Officer (predict@ucdavis.edu) within 24 hours (if the unanticipated problem is serious) or 72 hours (if the problem is not serious) using the form in Appendix IV.

Adverse Events and Serious Adverse Events

It is possible that during the course of study activities, a participant may experience discomfort or distress. Certain discomforts, such as pain at the site of blood collection and discomfort answering sensitive questions, are expected and detailed in the study protocol. Additional possible risks to study participation may be identified for a given site upon consultation with a local risk expert.

If, during the course of study operations, a participant reports or exhibits one of these anticipated adverse reactions to study participation (be it physical, mental, emotional, or social), that adverse reaction, or "adverse event," should be documented and reported to the human surveillance/field coordinator (if one is active in the country) and Country Coordinator promptly, but no later than within five working days (see the Reportable Information, Unanticipated Problem, and Adverse Event Reporting Form, Appendix IV). Once the Country Coordinator learns of the Adverse Event, he or she should report it to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) within **72 hours**.

In the event a participant reports or exhibits a ***serious*** adverse event that is ***unexpected,*** that is likely ***related*** to study activities, and that implies the ***level of risk to all study participants may be higher than previously expected***, that serious adverse event should be reported to the human surveillance/field coordinator (if one is active in the country) or Country Coordinator within five working days. The human surveillance/field coordinator should report the event to the Country Coordinator, and the Country Coordinator should report the event to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) **within 24 hours**.

The Lead PREDICT PI and Operations Officer are responsible for notifying the UCD IRB within the same time frame (72 hours for adverse events; 24 hours for serious adverse events). The Country Coordinator should report these adverse events to the in-country IRB or ethical committee if and as required to do so.

After becoming aware of any adverse event, the Country Coordinator should confer with their regional lead, the PREDICT global team, and relevant IRBs/ethical boards to determine what steps, if any, should be taken to address the adverse event and prevent similar future events.

Section 5.4.14. Site Monitoring

Each in-country team should work together in the first year to implement key procedures from the PREDICT IRB Compliance and Monitoring Guide on site monitoring and reporting (summarized in Appendix 5). Country Coordinators will be expected to work with PREDICT POCs at hospital and clinic sites to develop a regular system for transferring key study documents, reviewing records for completion, and addressing issues or concerns that arise during study activities.

As part of monitoring and reporting plans, at the completion of each surveillance period, generally on a calendar year schedule, a data and safety review will be conducted by a representative of the PREDICT global or regional management team. At this review, safety information and adverse events collected during the performance period will be discussed and addressed. Data may include case report forms, notes from study visits, and or any telephone calls to the PI from participants.

Section 5.4.15. References

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6. GUIDELINES AND PROTCOLS FOR HUMAN AND ANIMAL SUBJECTS RESEARCH

For human subjects research, our protocols will align with PREDICT protocols with which our in-country teams have been complying for four years. They will be modified to reference the specifics of this project's IRB (as opposed to PREDICT's IRB).

- 5.4 Human Syndromic Surveillance (see next page)

For animal subjects research, our protocols will align with PREDICT protocols, with which our in-country teams have been complying for four years. These protocols are listed below and, as they are very extensive, a link to access them is provided. They will be modified to reference the specifics of this project's IACUC (as opposed to PREDICT's IACUC):

- 5.2.5 Safe Animal Capture and Sampling
- 5.2.7 Bat Sampling Methods
- 5.2.8 Rodent Sampling Methods
- 5.2.9 Small Carnivore Sampling Methods
- 5.2.11 Livestock Sampling Methods

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "Field Sampling Guides."

7. GUIDELINES FOR SAMPLE TRANSPORT

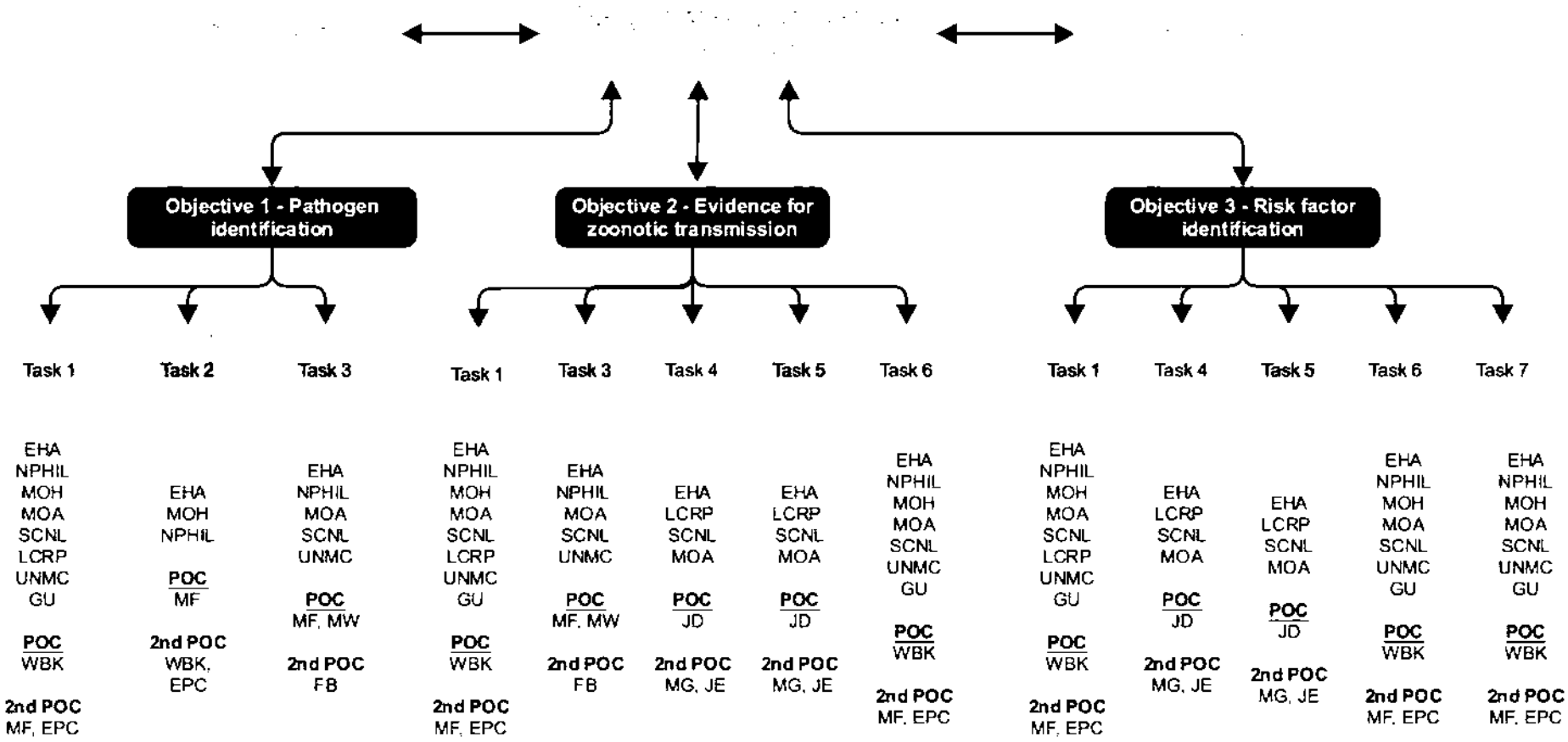
Sample transport from the animal field sites will follow established protocols from the PREDICT project, which SCNL has been implementing for four years. SCNL will also transport the human samples from the hospital sites and the field sites; we will adhere to these cold chain protocols except where necessary to modify to meet the project's specific requirements:

- 6.1 Implementing Cold Chain for Safe Sample Transport and Storage

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "General Information."

8. OPERATIONAL FRAMEWORK

Please see next two pages for the operational framework and mapping of performers to tasks, hypotheses, and objectives.



INITIALS

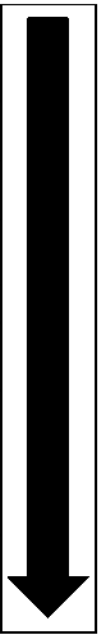
WBK: William B. Karesh (EHA) - PI
MF: Mosoka Fallah (NPHIL) - Co-I
EPC: Ellen P. Carlin (EHA) - Co-I
JE: Jonathan Epstein (EHA) - Co-I
JD: James Desmond (LCRP)
MW: Michael Wiley (UNMC)
FB: Fatorma Bolay (NPHIL)
AL: Anne Laudisoit (EHA)
MG: Michael Garbo (SCNL)

TASKS

Task 1: Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
Task 2: Enroll human patients and undertake sampling (Y1-3 & OY1-2)
Task 3: Undertake sample processing and testing (Y1-3 & OY1-2)
Task 4: Undertake preliminary animal sampling (Y1)
Task 5: Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2)
Task 6: Analyze data (Y2-3 & OY1-2)
Task 7: Disseminate information to stakeholders (Y2-3 & OY1-2)

ORGANIZATIONS

EHA: EcoHealth Alliance
NPHIL: National Public Health Institute of Liberia
MOH: Liberia Ministry of Health (via MOU with NPHIL)
MOA: Ministry of Agriculture (via MOU with NPHIL)
SCNL: Society for the Conservation of Nature Liberia
LCRP: Liberia Chimpanzee Rescue and Protection
UNMC: University of Nebraska Medical Center
GU: Georgetown University

<table>
<tr><td rowspan="7">Supporting Task</td><td>All partners</td><td colspan="3">T1: Research platform establishment</td><td rowspan="9">  </td></tr>
<tr><td>EHA NPHIL MOH</td><td>T2: Human sampling</td><td></td><td></td></tr>
<tr><td>EHA UNMC NPHIL MOA</td><td>T3: PCR, NGS, serology</td><td>T3: PCR, NGS, serology</td><td></td></tr>
<tr><td>EHA SCNL LCRP MOA</td><td></td><td>T4: Preliminary animal sampling</td><td>T4: Preliminary animal sampling</td></tr>
<tr><td>EHA SCNL LCRP MOA</td><td></td><td>T5: Animal sampling & risk interface assessment</td><td>T5: Animal sampling & risk interface assessment</td></tr>
<tr><td>All partners</td><td></td><td>T6: Data analysis</td><td>T6: Data analysis</td></tr>
<tr><td>All partners</td><td></td><td></td><td>T7: Data dissemination & utlization to reduce threat and & risk</td></tr>
<tr><td>Tested Hypothesis</td><td>?</td><td>H1: Emergent and/or high-risk pathogens cause an undiagnosed subset of acute febrile illness in humans in Liberia</td><td>H2: A subset of AFI cases are due to high-consequence zoonoses, even among patients who test positive for endemic pathogens</td><td>H3: Exposure to domestic animals and wildlife increases the likelihood that AFI cases result from zoonotic animal to human transmission</td></tr>
<tr><td>Objective achieved</td><td>✓</td><td>O1: Identify causative agents of AFI in Liberia</td><td>O2: Identify evidence for zoonotic transmission of high-consequence AFI pathogens</td><td>O3: Indentify risk factors for zoonotic AFI in humans</td></tr>
</table>

July 25, 2019

To Whom It May Concern:

Please find enclosed our technical proposal, ***Reducing the threat from high-risk pathogens causing febrile illness in Liberia*** **(HDTRA1-14-24-FRCWMD-BAA WMD, Grant #12819625)**. We request that this Phase II application be assigned for review by the Defense Threat Reduction Agency, Biological Threat Reduction Program Thrust Area 6—Cooperative Counter WMD Research with Global Partners.

The West Africa Ebola crisis underscored the critical need to examine etiology of acute febrile illness (AFI) toward understanding prevalence, improving in-country syndromic surveillance, diagnostic capability, and research capacities, and promoting adherence to international health security frameworks such as the International Health Regulations (2005), the Biological & Toxins Weapons Convention, and the Performance of Veterinary Services Pathway. The proposed effort is designed to test hypotheses related to the causative and underappreciated agents of AFI and is distinct from other studies in its rigorous investigation of these illnesses in the context of the human-animal interface.

With Liberian and other partners, we will identify critical weaknesses in disease detection in Liberia at clinical and laboratory stages and enable the development of updated clinical, surveillance, and reporting protocols to reduce risk. The project will support Liberia's One Health Coordination Platform (OHCP) by using an integrated human-animal approach to surveillance and detection of high-consequence zoonotic pathogens, and by ensuring that all relevant sectors are included in data sharing and training workshops. The efforts will support Liberia's priority of multi-sectoral health coordination and leverage the relationships established through the OHCP. Building on existing DTRA investments, this project will help ensure continuity of past and ongoing training and capacity building efforts. By collating results from a similar project in development for Guinea and coordinating with other in-country febrile illness studies, this work will help produce a regional picture of febrile zoonotic disease risk in West Africa that can inform U.S. and global personnel decisions in the region, surveillance efforts, and medical countermeasure investment priorities.

We thank you for your consideration of our request.

Sincerely,

William B. Karesh, DVM
Executive Vice President for Health and Policy

EcoHealth Alliance
460 West 34th Street, Suite 1701
New York, NY 10001-2320
212.380.4460
EcoHealthAlliance.org

Statement of Work

Project Title: Reducing the threat from high-risk pathogens causing febrile illness in Liberia

Document Date: July 26, 2019

Objective: This project will build Liberian capacity for threat reduction through an integrated human-animal surveillance approach to high consequence zoonotic pathogens associated with human acute febrile illness (AFI) including Ebola virus, Lassa virus, and other emerging infections. We will identify and characterize the etiological agents of infectious AFI in Liberia, particularly among patients with a history of animal contact. Many AFI causative agents may go undetected empirically by common rapid diagnostic tests or by existing surveillance platforms. We will work to mitigate this challenge through scientific discovery, hypothesis testing, and capacity building while leveraging significant U.S. government and other investment in workforce building and laboratory infrastructure. Training provided to local partners in critical biosecurity and biosafety skillsets will include: sample transport and laboratory biosafety and biosecurity; human and animal sampling approaches; performance of both routine and advanced molecular diagnostic assays; cold-chain transport implementation; and data analysis and reporting. As many emerging diseases have been inadequately studied in Liberia, this project will provide fundamental baseline knowledge of pathogens circulating and potentially causing human illness. Its outcomes will suggest opportunities for improved clinical training, tailored case definitions, and other methods to improve identification rates for especially dangerous pathogens at the index case level and prior to widespread transmission. The desired endpoint is a broad, sustainable surveillance program that enhances public and global health security.

Scope: The grantee proposes a five-year multi-disciplinary study incorporating the epidemiology, ecology, and microbiology of AFI in Liberia. The grantee team shall focus on the following major **goals** and milestones:

1. **Identify causative agents of AFI in Liberia**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Enroll human patients and undertake sampling (Y1-3 & OY1-2)
    - Undertake sample processing and testing (Y1-3 & OY1-2)
2. **Identify evidence for zoonotic transmission of high-consequence AFI pathogens**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Undertake sample processing and testing (Y1-3 & OY1-2)
    - Undertake preliminary animal sampling (Y1)
    - Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2)
    - Analyze data (Y2-3 & OY1-2)
3. **Identify risk factors for zoonotic AFI in humans**
    - Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia (Y1)
    - Undertake preliminary animal sampling (Y1)
    - Visit communities: human-animal interface assessment, animal sampling, and human serology (Y2-3 & OY1-2)

- Analyze data (Y2-3 & OY1-2)
- Disseminate information to stakeholders (Y2-3 & OY1-2)

Background: Limited detection and diagnostic capacity by definition results in a limited ability of clinicians and public health professionals to accurately identify infectious agents. Febrile illness can be caused by pathogens other than malaria and typhoid that may include dozens of pathogens unassessed by health providers, including hemorrhagic fever viruses; bacterial Select Agents such as *Burkholderia mallei/pseudomallei, Yersinia pestis, and Coxiella burnetti;* and any number of as-yet unknown pathogens. Because the incidence of such agents has not been assessed in Liberia, febrile illness thus presents an unquantified and undifferentiated burden to Liberian health and the health care system and continues to do so. Liberia's public health authorities do not assess incidence of febrile illness. Some studies are just beginning to assess this. Other published studies have reported on causative agents of infectious fever in other low- and middle-income countries (LMIC), including in West Africa. In low resource settings, and particularly where malaria is endemic, patients presenting with febrile illness may be treated presumptively for malaria and may not receive an accurate diagnosis. Co-infections may also be common, particularly with malaria parasites. Where studies have sought to investigate the source of febrile illness, high-risk pathogens of proliferation concern such as *Brucella*, dengue virus, and viral hemorrhagic fevers have been observed. The specific challenge for Liberian health authorities is that pathogens that result in a burden of febrile illness in the population—and the zoonotic transmission pathways that may drive it have not been systematically nor comprehensively identified.

Preliminary Data: This project will leverage more than four years of human and animal data collected during the USAID PREDICT Ebola Host Project in Liberia and in neighboring countries. To date, our team in Liberia has enrolled 585 people and sampled 5387 wild and domestic animals. That project has focused on determining the animal reservoir of Zaire ebolavirus and human behavior/activities to evaluate risk factors for spillover to people. Our research team, which included U.S. and Liberian partners, made the first discovery of the virus in a bat in West Africa. Partner discoveries have included a virus new to science, Bombali ebolavirus, in a bat in Sierra Leone. Anthropological investigation of the risk factors associated with zoonotic spillover events were also extensively addressed; data are still being collated and analyzed, but preliminary evaluation reveals trends in animal contact that vary by country, gender, age, and occupation. The data suggest that in the general Liberian population, some communities are nearly evenly split (up to 60%/40%) with members that have and do not have animal contact as defined by the survey; this informs our own study design in that it provides a sound statistical basis testing the questions at the root of our hypotheses, including whether animal contact is a risk factor for certain zoonotic febrile infections.

Most of the work of the Ebola Host Project is presently being prepared for publication. Key references available include:

- EcoHealth Alliance. 2019. *EcoHealth Alliance Scientists Discover the Deadly Zaire Ebola Virus in West African Bat* [press release]. Retrieved from: https://www.ecohealthalliance.org/2019/01/ecohealth-alliance-scientists-discover-the-deadly-zaire-ebola-virus-in-west-african-bat.
- Goldstein T, Anthony SJ, Gbakima A, et al. The discovery of Bombali virus adds further support for bats as hosts of ebolaviruses. *Nat Microbiol* 2018;3:1084-1089.

Tasks/Scientific Goals: **(Format: Year #(s).Task #. Sub-task#)**

TASK 1

1.1: Establish an evidence-based research platform for assessing and addressing high-consequence pathogens in Liberia

The grantee shall oversee refinement and finalization of human and animal study protocols and data collection instruments. This stage incorporates planning and training in the protection of human subjects and animal subjects; training in laboratory biosafety, biosecurity, and safe disposal of samples or sampling materials after laboratory work (which will adhere to guidelines in the BMBL 5th edition, sections III – VI[25]); laboratory diagnostic techniques; and any necessary revisions to original sampling and testing approach based on DTRA feedback and discussion at the kick-off meeting. We will refine our human subjects data collection tools, piloting our instruments within our research network to assure validity and reliability of the questionnaires. A database will be created for secure data entry and data storage of human subjects data. MOH will assign personnel to train clinical staff and oversee study in clinics in Monrovia and Bong. NPHIL and CVL will assign personnel to laboratory. EHA and Liberian partners will host kick-off meeting in Monrovia, Liberia to which all partners will be invited. Each study partner will present on its roles and specific desired outcomes to support its agency's priorities. In addition, we will invite other researchers undertaking febrile illness and related research in-country, such as the U.S. Centers for Disease Control and Prevention (AFI study), the Walter Reed Army Institute of Research (Joint West Africa Research Group), and the Henry Jackson Foundation (sepsis study). Human subjects research and lab training workshops will occur during kick-off.

1.1.1 Refine and finalize human and animal study protocols and data collection instruments
1.1.2 Secure and finalize all research permits (human and animal) including IRB, IACUC, and national approvals in Liberia
1.1.3 Assign MOH, NPHIL, and CVL staff to field and laboratory positions
1.1.4 Host kick-off meeting in Liberia
1.1.5 Conduct Workshop 1a: overall research protocol (concurrent with Task 1.1.4)

TASK 2

1.2 – O2.2: Enroll human patients and undertake sampling

We will enroll febrile patients at two hospitals in Y1-3 and two hospitals in Y4-5 to collect blood and respiratory samples and transport them to the Liberia Institute for Biomedical Research (LIBR) for testing. Cross-sectional sampling will be used to provide a representative sample of a relatively urban or relatively rural population (depending on site) of individuals with fever. Longitudinal sampling of target populations (not individuals) across up to 2.5 years per clinical study site will maximize the opportunity for detection and possibly reveal seasonal trends in infection or other time-related changes in trends. Sampling will be based on available volume in the clinical sites but is designed to assure detection of rare pathogens and answering questions about the relative proportion of febrile illness caused by each; we are targeting 1,500 patients at the first two hospitals total, and 1,500 at the second set of sites in the option years. We will review historical and concurrent surveillance reports for the study counties and for neighboring counties as comparators. MOH will provide a locally hired on-site project coordinator to work with the hospital team and oversee the study protocol (train clinicians and nurses; be alerted when febrile patients arrive; work with hospital staff to oversee informed consent, enrollment, sample collection, and interviews). will train study staff in human subjects research and patient

recruitment; biosafety, safe and secure sample collection, handling, packaging, and transport; and implementation of the study protocol. Training will provide the principles for safe and ethical human subjects research; and project-specific teachings to ensure staff understand, practice, and can implement the study protocol (enrollment determination, informed consent, and questionnaire administration (demographic information, animal ownership), sample acquisition, data entry, and sample packaging and readying for transport).

1.2.1, 3.2.1 Conduct Workshop 2a: IRB/human subjects research

1.2.2-O2.2.2 Locally-hired project coordinator reports to hospital at each study site

1.2.3-O2.2.3 Enroll patients (continuous)

TASK 3

1.3 – O2.3: Undertake sample processing and testing

LIBR reception personnel will be briefed on the study protocol and will notify the project supervisor on receipt of the samples, at which point study-specific inventory and storage procedures will be followed. LIBR has an ABI 7000 Sequence Detection System in operation on which the laboratory scientists and technicians are well trained; a MiSeq system for NGS that is available but requires staff training; and ELISA platforms for serology. NPHIL will budget for and be responsible for ordering needed consumables throughout the project, and UNMC will provide assistance, training, and oversight. LIBR staff are already trained in real-time PCR and ELISA platforms; UNMC will refresh these skills and provide additional training via two one-week didactic and hands-on workshops Y1; another dedicated workshop in Y3; and in other years if needed via visits to the laboratory. These will cover execution of specific pathogen tests, advanced techniques (NGS), and results interpretation (including NGS bioinformatics); sample inventory management; and biorisk management. UNMC will provide oversight and mentorship through their at least twice-yearly working visits to Monrovia and the laboratory as well as video and teleconference. UNMC will leverage its additional DTRA work at LIBR (under funding consideration) to assist with skill-building among laboratory scientists and technicians there. UNMC will assess competence at each visit via a standardized evaluation form to use as a basis for targeted future training.

1.3.1-O2.3.1 Provide necessary equipment and consumables to NPHIL laboratory (continuous)

1.3.2, 3.3.2 Conduct Workshop 3a: laboratory biosafety and biosecurity, sample disposition

1.3.3, 3.3.3 Conduct Workshop 3b: laboratory sample testing techniques

1.3.4-O2.3.4 Provide continuous on-the-job training in laboratory techniques

1.3.5 Submit annual report (Y1)

2.3.6 Host workshop on results interpretation/bioinformatics

3.3.7 Host regional technical ad networking workshop

TASK 4

1.4 – 3.4 Undertake preliminary animal sampling

While laboratory training is beginning, preliminary field animal sampling will begin in Y1 with sampling in communities selected based on previous cases of AFI from historical hospital admissions trends, including some communities from which the study site hospitals draw patients. We will review a sampling of hospital records from Monrovia and Bong in search of geographic trends in AFI presentations going back three years, and begin randomized sampling

of peridomestic and wild animals in four communities identified as part of this process and continue every three months. In five-day/five-night trips we will target approximately 50 bats, 50 rodents, 50 livestock (including chickens if poultry-transmitted infection is suspected), and 10 dogs per sampling event, allowing for approximately 640 animals sampled in Y1 to include blood and oral/nasopharyngeal specimens, and feces and urine when possible. Our teams are trained in species identification, and we will also plan to barcode approximately 5% of individual bats and rodents in Y1 to improve species determination and team training. All animals will be non-lethally sampled with strict adherence to U.S. IACUC-approved protocols following those currently used by EHA scientists globally (Attachment 3) and using bat and rodent sampling protocols we developed for the PREDICT project (Attachment 3). All personnel undertaking animal sampling will be will be trained to ensure competency with a combination of didactic and practical training. SCNL will transfer samples to LIBR consistent with PREDICT protocols (Attachment 3).

1.4.1, 3.4.1 Conduct Workshop 4b: IRB/human subjects research (for animal teams)

1.4.2 Review hospital records in search of geographic trends in acute febrile illness presentations

1.4.3 Sample in communities identified as part of this process and continue every three months

TASK 5

1.5 – O2.5: Visit communities: human-animal interface assessment, animal sampling, and human serology

Animal sampling will continue in Y2, expanding to communities of enrolled patients, sampling in and around study enrollees' homes and surrounding areas; we plan to reach three communities in Y2. This task predominantly supports Hypothesis 3. It is designed to: a) assess the risk interface between people and animals; b) strategically target and sample animal species for the pathogens/antibodies they are most likely to have based on what is already known about pathogen-host proclivity; and c) enable follow-up serology on patients and their community neighbors. We will sample five communities in the catchment areas of Redemption and Phebe Hospital, targeting 400 animals per community, and the patient plus 20 neighbors per community for human interviews and blood sampling. In option years, we will target three communities with the same numbers of animal and human subjects per community.

2.5.1-O2.5.2 Review study patient records for geographic trends in AFI presentations

2.5.2-O2.5.3 Undertake sampling in and around study enrollees' homes

2.5.3-O2.5.4 Undertake sampling from broader patients' communities

2.5.4-O2.5.5 Administer human-animal interface assessment

2.5.5-O2.5.6 Collect human samples for serology

TASK6

2.6 – O2.6: Analyze data

We will compare any diagnoses established at the clinical sites to laboratory results; and compare clinical study site diagnoses and laboratory results to national weekly and monthly county surveillance records. We will estimate population in catchment areas (from where the patient population comes) to develop prevalence estimates of each detected pathogen. We will compare phylogenetic sequence data from humans and animals to identify possible shared strains and infer transmission. Using the questionnaire data comparisons of exposure variables across

varying demographics measures in study sites will be conducted to characterize high risk behaviors and statistical analysis will be employed to identify differences between groups with a 95% probability of detecting a difference. As appropriate, multivariate analysis will be utilized to evaluate the relationship between the positive biological findings and key measures of contact to evaluate the factors that influence and may have led to AFI pathogen exposure. The pathogen and human interface data collected in this study; characterization of zoonotic potential through phylogenetic analyses undertaken in this and other studies (such as PREDICT); and additional data such as available spatial, ecological, and environmental data will inform models designed to help tease correlation from causation. The data will thus provide the foundation of an OY2 risk reduction workshop. We will also compare diagnostic results for endemic agents to reports for these diagnoses in the preceding years to allow for control for any changed practices (even if subconscious) in our target counties based on the project team's presence; this will also allow for a controlled comparison of the impact on incidence of any differential diagnosis or testing interventions we may implement in OY1 and OY2. We will develop recommendations for adapted differential diagnostic protocols and testing practices.

2.6.1-O2.6.1 Undertake data analysis

TASK 7

2.7-O2.7: Disseminate information to stakeholders

We will host the annual stakeholders meeting to which we will invite all project partners as well as others doing related research in country. We will discuss preliminary data and analyses and use these to inform any needed modifications to forward sampling strategy. We will review protocols for biosafety, specimen transport, and animal handling at each annual meeting. We will provide support travel for at least one (1) Liberian scientist to present at an international conference. We will share samples as appropriate with other in-country projects to ensure synergies. We will compile and summarize research results and share with all partners and other in-country researchers as appropriate and use it to develop an annual report for DTRA. In Y3, we will broaden annual stakeholders meeting to include regional partners from Guinea and possibly other adjacent countries; share information about ongoing research; plan cross-border study for OY1. We will broaden outreach in Y3 and OY2 to communities that have engaged in sampling to share results and discuss preliminary risk mitigation strategies. Project data will provide the foundation of an OY2 risk reduction workshop at the annual meeting to engage multi-sectoral Liberian participants to review statistical evaluation of diagnostic data, identify key risk interfaces, assess economic options for prevention and control, and develop threat reduction measures. Workshop products include 1) development of priorities for refined PCR and serological tests based on study findings, 2) recommendations for an updated national surveillance and reporting strategy and plan, 3) inclusion of stakeholders (e.g., National Disaster Management Authority, the Forestry Development Authority, the Ministry of Finance) to consider options for risk and impact reduction and generate policy recommendations. We will work with MOH and MOA to develop written educational products designed for laypersons to explain project results, community impact, and risk mitigation, and thank community members for their participation.

2.7.1-O2.7.1 Host annual stakeholders meeting

2.7.2-O2.7.2 Present to DTRA at Annual Technical Review

2.7.3-O2.7.3 Submit annual report

2.7.4-O2.7.4 Share specimens if available and appropriate with other in-country researchers

2.7.5, O2.7.5 Support Liberian scientist to present at international conference
3.7.6 Host regional technical and networking workshop
3.7.7-O2.7.7 Prepare/submit up to two (2) peer-reviewed manuscripts
3.7.8, O2.7.8 Engage sampled communities for follow-up education
O2.7.9 Conduct Workshop 6a: risk reduction workshop

Cost estimate: Y1: $995,517.56 Y2: S989,251.55 Y3: S996,113.74 OY1: $962,716.26
OY2: S969,218.86

Performance Schedule:

Task	Y1	Y2	Y3	OY1	OY2
Task 1: Establish evidence-based research initiative for high-consequence pathogens in Liberia					
1.1 Refine and finalize human and animal study protocols					
1.2 Secure and finalize all research permits (human and animal)					
1.3 Assign MOH, NPHIL, and CVL staff to field and lab positions					
1.4 Host kick-off meeting in Liberia					
1.5 Conduct Workshop 1a: overall research protocol					
Task 2: Enroll human patients and undertake sampling					
2.1 Conduct Workshop 2a: IRB/human subjects research					
2.2 Local project coordinator reports to hospital at each study site					
2.3 Enroll patients (continuous)					
Task 3: Undertake sample processing and testing					
3.1 Provide equipment and consumables to LIBR					
3.2 Conduct Workshop 3a: biosafety/biosecurity, sample disp.					
3.3 Conduct Workshop 3b: laboratory sample testing techniques					
3.4 Provide on-the-job training in lab techniques (continuous)					
3.5 Submit Y1 annual report					
3.6 Conduct Workshop 5a: results interpretation, bioinformatics					
3.7 Host regional technical and networking workshop					
Task 4: Preliminary animal sampling					
4.1 Conduct Workshop 4a: IACUC/animal subjects research					
4.2 Review hospital records for geo. trends in AFI presentations					
4.3 Sample animals in select communities (preliminary)					
Task 5: Visit communities: interface assessment, animal sampling, human serology					
5.1 Review study patient records for geographic AFI trends					
5.2 Administer human-animal interface assessment					
5.3 Undertake animal sampling in/around study enrollees' homes					
5.4 Undertake animal sampling from patients' communities					
5.5 Collect human samples for serology					
Task 6: Analyze data					
6.1 Undertake data analysis					
Task 7: Disseminate research results to stakeholders					
7.1 Host annual Stakeholders meeting					
7.2 Present to DTRA at Annual Technical Review					
7.3 Submit annual report					
7.4 Share specimens if appropriate w/ other in-country researchers					
7.5 Support Liberian scientist to international conference					
7.6 Host regional technical and networking workshop					
7.7 Prepare/submit up to two (2) peer-reviewed manuscripts					
7.8 Engage sampled communities for follow-up education					
7.9 Conduct Workshop 6a: risk reduction workshop					

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 10

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA12010016	01 Jun 2020	

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182317 COLUMBUS OH 43218-2317	HQ0337

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	See Schedule

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				

15G. TOTAL AMOUNT OF CONTRACT **$4,912,818.06**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM	1		I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2			**PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.**	
X	C	DESCRIPTION/ SPECS./ WORK STATEMENT	3	X	J	LIST OF ATTACHMENTS	10
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	4		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	5				
X	G	CONTRACT ADMINISTRATION DATA	6 - 9		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] SEALED-BID AWARD (Contractor is not required to sign this document.)
Your bid on Solicitation Number _____
including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the terms listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		(b)(6) BY _____ (Signature of Contracting Officer)	27-May-2020

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot	$4,912,818.06	$4,912,818.06

Year 1: FRBAA14-6-2-0436
FFP
Reducing the threat from high-risk pathogens causing febrile illness in Liberia. In accordance with the following attachements: SOW at attachement 1 dated 7/26/2019 and DTRA Terms and Conditions for Grant Awards dated 4/18/2018 at attachment 2
FOB: Destination
U009

NET AMT $4,912,818.06

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Funding in support of CLIN 0001
FFP

NET AMT $0.00

ACRN AA $4,912,818.06
CIN: HDTRA10335520001

Section C - Descriptions and Specifications

CLAUSES INCORPORATED BY FULL TEXT

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-11-16-BRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.351

c. **Authority:** 10 U.S.C 2358 as amended

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	N/A	N/A	Destination	Government
000101	N/A	N/A	N/A	N/A

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
0001	POP 01-JUN-2020 TO 31-MAY-2025	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20202022 D 3400 0901515BR_KD_BP_TB_20 2022_0134_3400_SCNCT DTRA 410
AMOUNT: $4.912.818.06

ACRN	CLIN/SLIN	CIN	AMOUNT
AA	000101	HDTRA10335520001	$4,912,818.06

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

d. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/BE-BCR
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

e. Grantee Business Office:
Name: Dr. Aleksei Chmura
Title: Authorized Organizational Representative
Phone: (212) 380-4473
E-mail: chmura@ecohealthalliance.org

f. Grantee Principal Investigator (PI):
Name: Dr. William Karesh
Title: Executive Vice President of Health and Policy
Phone: (212) 380-4463
E-mail: karesh@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

g. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

FUNDING PROFILE:

The amount of $4,912,818.06 is obligated for work to be performed during the period beginning with grant award and continuing through May 31, 2025

The Government's liability is limited to the amount obligated

INVOICE SCHEDULE

1	6/30/2020	$81,880.36
2	7/31/2020	$81,880.30
3	8/31/2020	$81,880.30
4	9/30/2020	$81,880.30
5	10/31/2020	$81,880.30
6	11/30/2020	$81,880.30
7	12/31/2020	$81,880.30
8	1/31/2021	$81,880.30
9	2/28/2021	$81,880.30
10	3/31/2021	$81,880.30
11	4/30/2021	$81,880.30
12	5/31/2021	$81,880.30
13	6/30/2021	$81,880.30
14	7/31/2021	$81,880.30
15	8/31/2021	$81,880.30
16	9/30/2021	$81,880.30
17	10/31/2021	$81,880.30
18	11/30/2021	$81,880.30
19	12/31/2021	$81,880.30
20	1/31/2022	$81,880.30
21	2/28/2022	$81,880.30
22	3/31/2022	$81,880.30
23	4/30/2022	$81,880.30
24	5/31/2022	$81,880.30
25	6/30/2022	$81,880.30
26	7/31/2022	$81,880.30
27	8/31/2022	$81,880.30
28	9/30/2022	$81,880.30
29	10/31/2022	$81,880.30
30	11/30/2022	$81,880.30
31	12/31/2022	$81,880.30
32	1/31/2023	$81,880.30
33	2/28/2023	$81,880.30
34	3/31/2023	$81,880.30
35	4/30/2023	$81,880.30
36	5/31/2023	$81,880.30
37	6/30/2023	$81,880.30
38	7/31/2023	$81,880.30
39	8/31/2023	$81,880.30
40	9/30/2023	$81,880.30
41	10/31/2023	$81,880.30
42	11/30/2023	$81,880.30
43	12/31/2023	$81,880.30
44	1/31/2024	$81,880.30
45	2/29/2024	$81,880.30

46	3/31/2024	$81,880.30
47	4/30/2024	$81,880.30
48	5/31/2024	$81,880.30
49	6/30/2024	$81,880.30
50	7/31/2024	$81,880.30
51	8/31/2024	$81,880.30
52	9/30/2024	$81,880.30
53	10/31/2024	$81,880.30
54	11/30/2024	$81,880.30
55	12/31/2024	$81,880.30
56	1/31/2025	$81,880.30
57	2/28/2025	$81,880.30
58	3/31/2025	$81,880.30
59	4/30/2025	$81,880.30
60	5/31/2025	$81,880.30

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	Statement of Work	8	26-JUL-2019
Attachment 2	Terms and Conditions	18	06-APR-2018

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 11

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA12010018	30 Jun 2020	

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182317 COLUMBUS OH 43218-2317	HQ0337

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	**See Schedule**

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				

15G. TOTAL AMOUNT OF CONTRACT **$4,995,106.37**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM	1		I	CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 3			**PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.**	
X	C	DESCRIPTION/ SPECS./ WORK STATEMENT	4	X	J	LIST OF ATTACHMENTS	11
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
X	E	INSPECTION AND ACCEPTANCE	5		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
X	F	DELIVERIES OR PERFORMANCE	6				
X	G	CONTRACT ADMINISTRATION DATA	7 - 10		L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] SEALED-BID AWARD (Contractor is not required to sign this document.)
Your bid on Solicitation Number _____
including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the terms listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		BY (b)(6) (Signature of Contracting Officer)	30-Jun-2020

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot	$4,995,106.37	$4,995,106.37

Year 1: FRBAA14-6-2-0356
FFP
Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania. In accordance wiht the following attachements: SOW at attchement 1 dated 3/18/2018 and DTRA Terms and Conditions for Grant Awards dated 8/1/2018 at attachment 2
FOB: Destination
U009

NET AMT $4,995,106.37

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Funding to support CLIN 001
FFP

NET AMT $0.00

ACRN AA $4,848,483.14
CIN: HDTRA10345980001

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000102					$0.00
	Funding to support CLIN 001 FFP				
				NET AMT	$0.00
	ACRN AC CIN: HDTRA10345980002				$146,623.23

Section C - Descriptions and Specifications

CLAUSES INCORPORATED BY FULL TEXT

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-11-16-BRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.351

c. **Authority:** 10 U.S.C 2358 as amended

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	N/A	Destination	Government
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
0001	POP 01-JUL-2020 TO 30-JUN-2025	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
000102	N/A	N/A	N/A	N/A

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20202022 D 3400 0901515BR_KD_BP_TB_20 2022_0134_3400_SCNCT DTRA 410
AMOUNT: $4,848,483.14

AC: 044315 097 0134 000 N 20182020 D 34HQ 0901515BR_KD_BP_OT_18 1820_0134_34HQ_SCNCT DTRA 410
AMOUNT: $146,623.23

ACRN	CLIN/SLIN	CIN	AMOUNT
AA	000101	HDTRA10345980001	$4,848,483.14
AC	000102	HDTRA10345980002	$146,623.23

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

d. Grant Specialist:
Name: (b)(6)
Defense Threat Reduction Agency/BE-BCR
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

e. Grantee Business Office:
Name: Alexia Churma
Title: Authorized Organizational Rep
Phone: (212) 380-4460
E-mail: chmura@ecohealthalliance.org

f. Grantee Principal Investigator (PI):
Name: Melinda Rostal
Title: Senior Research Scientist
Phone: (212) 380-4460
E-mail: rostal@ecohealthalliance.org

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

g. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/
8725 John J. Kingman Road, MS 6201

Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

FUNDING PROFILE:
The amount of $4,995,106.37 is obligated for work to be performed during the period beginning with grant, July 1 2020, award and continuing through June 30 2025.

The Government's liability is limited to the amount obligated

Invoice Schedule

1	7/1/2020	$81,886.97
2	8/1/2020	$81,886.99
3	9/1/2020	$81,886.99
4	10/1/2020	$81,886.99
5	11/1/2020	$81,886.99
6	12/1/2020	$81,886.99
7	1/1/2021	$81,886.99
8	2/1/2021	$81,886.99
9	3/1/2021	$81,886.99
10	4/1/2021	$81,886.99
11	5/1/2021	$81,886.99
12	6/1/2021	$81,886.99
13	7/1/2021	$81,886.99
14	8/1/2021	$81,886.99
15	9/1/2021	$81,886.99
16	10/1/2021	$81,886.99
17	11/1/2021	$81,886.99
18	12/1/2021	$81,886.99
19	1/1/2022	$81,886.99
20	2/1/2022	$81,886.99
21	3/1/2022	$81,886.99
22	4/1/2022	$81,886.99
23	5/1/2022	$81,886.99
24	6/1/2022	$81,886.99
25	7/1/2022	$81,886.99
26	8/1/2022	$81,886.99
27	9/1/2022	$81,886.99
28	10/1/2022	$81,886.99
29	11/1/2022	$81,886.99
30	12/1/2022	$81,886.99
31	1/1/2023	$81,886.99
32	2/1/2023	$81,886.99
33	3/1/2023	$81,886.99
34	4/1/2023	$81,886.99
35	5/1/2023	$81,886.99
36	6/1/2023	$81,886.99
37	7/1/2023	$81,886.99
38	8/1/2023	$81,886.99
39	9/1/2023	$81,886.99
40	10/1/2023	$81,886.99
41	11/1/2023	$81,886.99
42	12/1/2023	$81,886.99
43	1/1/2024	$81,886.99
44	2/1/2024	$81,886.99
45	3/1/2024	$81,886.99

46	4/1/2024	$81,886.99
47	5/1/2024	$81,886.99
48	6/1/2024	$81,886.99
49	7/1/2024	$81,886.99
50	8/1/2024	$81,886.99
51	9/1/2024	$81,886.99
52	10/1/2024	$81,886.99
53	11/1/2024	$81,886.99
54	12/1/2024	$81,886.99
55	1/1/2025	$81,886.99
56	2/1/2025	$81,886.99
57	3/1/2025	$81,886.99
58	4/1/2025	$81,886.99
59	5/1/2025	$81,886.99
60	6/1/2025	$81,886.99
61	7/1/2025	$81,886.99

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	SOW	6	18-MAR-2018
Attachment 2	Terms and Conditions	14	01-AUG-2018

Statement of Work

Project Title: Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania

Document Date: March 18, 2018.

Objective: The objective of this grant is to reduce the threat of Crimean-Congo hemorrhagic fever (CCHF) by determining the presence and scale of CCHF virus (CCHFV) circulation in Tanzania. The awardee shall establish a multi-disciplinary team of Tanzanian and international One Health professionals to collect fundamental data on CCHFV, conduct rigorous scientific analyses and support the Government of Tanzania in the development of policies to control and reduce the threat of CCHF. Using a One Health approach the awardee shall investigate the following three hypotheses: 1) CCHFV is circulating in ticks, livestock and wildlife in Tanzania; 2) CCHFV is present and circulating in the human population in Tanzania; 3) CCHFV prevalence, seroprevalence and vector abundance will vary across an environmental disturbance gradient from peri-urban communities, to pastoral rangelands, to protected wildlife areas. The awardee shall support the capacity of Tanzanian human and animal health laboratories to detect anti-CCHFV antibodies, train Tanzanian field researchers and provide vital data to Tanzanian government partners and stakeholders to develop policies to prepare for and reduce the threat of a CCHF outbreak.

Scope: The grantee proposes a five-year multi-disciplinary study of epidemiology, ecology and impact of CCHF in northern Tanzania. The grantee team shall focus on the following major goals and milestones:

- Improve awareness of and capacity to respond to potential CCHF epidemics.
    - Host an annual stakeholders' and partners' meeting in Tanzania (Y1-OY2); initiate and maintain diagnostic capacity for detection of CCHFV (Y2-OY1); provide training for students and scientists (Y1-OY2).
- Use a One Health approach to identify CCHFV infection patterns in wildlife, cattle and humans across an environmental disturbance gradient.
    - Establish field study protocols (Y1); implement small mammal, cattle and human serosurveys (Y1-2); conduct serological assays on blood samples (Y3-OY1); conduct longitudinal study in humans (OY1); train a Tanzanian post-doctoral fellow to use spatial analyses to determine environmental correlates of CCHFV infection risk (OY2).
- Determine the abundance and CCHFV infection prevalence of tick vectors.
    - Establish tick field study protocols (Y1); implement tick sampling (Y1-2); conduct PCR assays on *Hyalomma* spp. ticks (Y3); analyze tick abundance in relation to environmental factors (Y3).
- Support One Health communication and policy development to reduce the threat of CCHF.
    - Host a policy development workshop (OY1); host an East African CCHF symposium (OY2).

Background: Crimean-Congo hemorrhagic fever is a **WHO Blueprint R&D priority disease** for which **there is an urgent need for accelerated research** given its **epidemic potential and the lack of countermeasures against CCHFV**. The Department of Health and Human Services considers CCHF as having the potential to pose a **severe threat to human health**. Similarly, **Tanzania identified viral hemorrhagic fevers as one of six priority zoonoses of greatest national concern**. Clinical signs and symptoms include fever, headache, thrombocytopenia, hemorrhagic disease and death in 30-40% of patients. CCHFV can be transmitted via multiple routes, including direct contact with infected animal tissues and transmission from *Hyalomma* spp. ticks. Human-to-human transmission has frequently been reported and if isolation practices are not implemented, nosocomial outbreaks can occur. Though it is not known to cause disease in animals, CCHFV circulates among both small mammals and large ruminants. Little is known about the status of CCHFV in Tanzania as the most recent cattle serosurvey occurred in 1974-75 (identifying a 9% seroprevalence) and despite neighboring Uganda and Kenya reporting multiple cases, no studies have investigated CCHF in humans in Tanzania.

Similar to the situation with Ebola virus prior to the 2014-16 outbreak, CCHFV antibodies were detected in people in Turkey as far back as 1980, yet no cases were reported until the start of the large outbreak in 2002-06 during which there were 1,103 confirmed cases. This "sudden" appearance of CCHF has been described in many regions that thereafter remain endemic for the virus, including Pakistan, Crimea and Turkey. **Human epidemics have often been linked to environmental and social changes,** which are associated with an increase in the abundance of CCHFV vectors. Thus using a One Health approach is vital to understanding CCHFV ecology, particularly in regions where environmental changes might drive disease emergence. CCHF is a frequent threat faced by U.S. warfighters working in endemic countries in Central Asia and the Middle East. Indeed, war is considered a driver for the emergence of CCHF as demonstrated by the outbreak among 200 Soviet troops in Crimea.

Key references include (further references can be found in the Project Narrative):

Pigott, D. M. et al. Local, national, and regional viral haemorrhagic fever pandemic potential in Africa: a multistage analysis. The Lancet 390, 2662-2672 (2017).

Messina, J. P. et al. The global distribution of Crimean-Congo hemorrhagic fever. Trans R Soc Trop Med Hyg 109, 503-513 (2015).

Hoogstraal, H. The epidemiology of tick-borne Crimean-Congo hemorrhagic fever in Asia, Europe, and Africa. J Med Entomol 15, 307-417 (1979).

Tasks/Scientific Goals: (given in the format: Year.Task.Subtask)

Task Y1.1-YO2.1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Strengthening Tanzania's capacity to consider CCHF as a differential diagnosis, conduct CCHFV diagnostic assays and improve inter-sector communication about this important zoonosis will improve their ability to identify, respond and prevent CCHF outbreaks. 1) The grantee shall mentor four graduate students or FETP fellows in fields that can contribute to our understanding of the epidemiology and ecology of CCHFV in Tanzania (Y1-OY2). 2) The awardee shall provide equipment to TVLA to permit them to sustainably maintain the sample cold chain and diagnostic workflow (e.g. a generator and an ultrafreezer) in Y1. 3) The awardee

shall train all field and laboratory staff (based on what is pertinent for their role) in: biosafety, safe and humane handling of animals, ethical conduct of research with human subjects, biosecurity, etc. in Y1, Y3 and OY1. 4) Through the annual meetings (Y1-OY2), additional meetings throughout the year and communication among stakeholders and between project partners the project shall strengthen the communication between relevant One Health sectors. 5) As the grantee knows of no laboratories conducting CCHFV diagnostics in Tanzania, the awardee shall provide intensive training in the use of serological and polymerase chain reaction (PCR) based assays for the diagnosis of CCHFV (Y3-OY1). The awardee shall select an assay for testing humans that requires recombinant antigen that would be possible to produce in country or in a neighboring country in order to improve the sustainability of the establishment of these assays at diagnostic laboratories in Tanzania. The awardee shall conduct two laboratory workshops on the importance of CCHFV and its diagnosis (Y3). 6) Following a majority of the field and laboratory work, the awardee shall host a policy workshop to present the results to an invited group of government and non-government representatives and using those results develop and provide a set of policy recommendations for the reduction of the threat of CCHFV in Tanzania to the Government of Tanzania (OY1). 7) The awardee shall train one Tanzanian post-doctoral fellow in the spatial ecology of infectious diseases at EcoHealth Alliance in New York City (OY2). 8) The awardee shall host a symposium on CCHF in East Africa and invite global leaders in CCHF research to exchange ideas on additional research that is needed, ways of increasing support for the growing group of CCHF experts in East Africa and ideas about the applicability of control measures being used in other regions that may be transferable to the situation in East Africa (OY2).

1.1.1-OY2.1.1 Train a minimum of four graduate students in fields related to CCHFV.
1.1.2-Y3.1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.
1.1.3-OY1.1.3 Train staff *in situ* in epidemiological field methods.
1.1.4-OY2.1.4 Support One Health relationships between partners and stakeholders.
1.1.5-OY1.1.5 Support laboratory capacity to conduct CCHFV diagnostics.
3.1.6 Host one workshop on diagnostic testing for CCHFV at each KCRI and TVLA.
OY1.1.7 Host a workshop to support CCHF policy development in Tanzania.
OY2.1.8 Mentor a Tanzanian post-doctoral fellow in spatial ecology of infectious diseases.
OY2.1.9 Host East African CCHF Symposium.

Task Y1.2-YO1.2: Determine CCHFV infection patterns, risk factors and incidence in humans.

To identify and characterize the risk of infection with CCHFV in people within the study area in northern Tanzania the grantee shall conduct several epidemiological studies. Despite the lack of CCHF outbreaks reported in Tanzania, there are confirmed cases of CCHF in neighboring Uganda and Kenya, the vector is present in Tanzania and we have previously identified circulating antibodies in livestock within the proposed study area. In order to confirm our hypothesis that CCHFV does infect people in Tanzania, the grantee shall 1) finalize IRB approvals in the U.S. and obtain the required permits and ethical approvals in Tanzania (Y1). 2) The awardee shall conduct a cross-sectional study approximately 1,586 people. People who

enroll shall be given a questionnaire in Swahili and asked to provide a blood sample (Y1-Y2). 3) Laboratory testing using an enzyme linked immunosorbent assay (ELISA) will be conducted at KCRI in Y3-OY1. A subset of samples will be shipped to UoG for confirmation. 4) A preliminary analysis of initial results of the human serosurvey will be completed in Y3 and reported with the results from the animal serosurveys (Y3). 5) In OY1 we will re-sample all willing participants to determine the incidence of CCHFV infection within the sampled population. These samples will be tested at KCRI as described in subtask 1.2.3.

1.2.1 Obtain local permissions and approvals to work with human subjects. 1.2.2-OY1.2.2 Conduct a cross-sectional study in people within the study area. 3.2.3-OY1.2.3 Conduct serological assays for the presence of anti-CCHFV antibodies. 3.2.4-OY1.2.4 Analyze human serosurvey results. OY1.2.5 Conduct incidence sampling among cross-sectional study participants.

Task Y1.3-Y3.3: Determine CCHFV infection patterns in cattle across varying environments.

The grantee shall conduct a cross-sectional study in cattle (and other animals, see Task 4) throughout the pastoral livestock and peri-urban areas of the study area to determine whether there is a difference in seroprevalence. 1) The awardee shall finalize the U.S. IACUC approvals and obtain all appropriate permits and ethical approvals required in Tanzania (Y1). 2) The grantee shall collect blood samples and ticks from cattle in Y1-Y2. The grantee shall use conduct an environmental disturbance assessment transect at each site to complement remote sensing data to establish the disturbance levels across the study area. 3) The collected ticks will be identified at TVLA by an experienced entomologist (Y3). 4) Cold chain will be maintained and the serum samples will be transferred to TVLA for analysis with the ID Screen® CCHF Double Antigen Multi-Species ELISA by IDVet. The ticks shall be tested for CCHFV via PCR at TVLA (Y3). A subset of samples shall be shipped to UoG for confirmation. 5) The cattle serosurvey results shall be analyzed and reported at the end of Y3.

1.3.1 Obtain local permits and permissions.

1.3.2-3.3.2 Conduct a cross-sectional serosurvey in cattle across two levels of environmental disturbance.

3.3.3 Collect and identify *Hyalomma spp.* ticks from sampled cattle.

3.3.4 Conduct laboratory analyses on cattle ticks and sera.

3.3.5 Analyze cattle serosurvey results.

Task Y1.4-OY2.4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.

Using a One Health approach the grantee shall conduct a cross-sectional study to compare the tick burden, CCHFV seroprevalence (in wildlife only) and CCHFV prevalence (in ticks only) across three different levels of environmental disturbance: peri-urban, pastoral livestock and protected areas. 1) The awardee shall finalize the U.S. IACUC approvals and obtain all appropriate permits and ethical approvals required in Tanzania (Y1). 2) The awardee shall trap small mammals at the sites where people and livestock are also being sampled as well as in the protected area (Y1-Y2). 3) The grantee shall also conduct tick transects to collect ticks from the vegetation (Y1-Y2). The cold chain shall be maintained and samples will be transferred to TVLA. 4) Ticks shall be speciated by an experienced TVLA technician. 5) Serum samples shall

be tested with the multispecies CCHFV ELISA kit. *Hyalomma* spp. ticks shall be tested for CCHFV by PCR (Y3). 6) The grantee shall work with partner TAWIRI to access banked serum and ticks collected from wild ruminants in protected areas (Y3). 7) The awardee shall complete and analysis and report of the wildlife serosurvey results at the end of Y3. 8) Since the multispecies ELISA has not been validated using seropositive sera from wildlife (it has been assessed in seropositive livestock samples) the grantee shall transfer 100 samples to PHE for confirmation using the gold standard CCHFV virus neutralization assay (OY2).

1.4.1 Obtain local permits and permissions.
1.4.2-2.4.2 Conduct cross-sectional study in small mammals.
1.4.3-2.4.3 Collect ticks from vegetation at study sites.
3.4.4 Identify ticks collected from small mammals and transects.
3.4.5 Conduct laboratory analyses for CCHFV antibodies and viral RNA.
3.4.6 Test banked serum from wild ungulates.
3.4.7 Analyze wildlife serosurvey results.
OY2.4.8 Confirm seropositive wildlife samples with virus neutralization assays.

Task Y1.5-OY2.5: Disseminate reports to relevant stakeholders.

The awardee shall synthesize all research and capacity building activities described above and 1) An Annual Research Performance Progress Report, Quad Chart and Metrics will be submitted to DTRA and the project shall submit the Annual Sample Repository information using a DTRA-specified format (Y1-OY2). Quarterly reports shall also be submitted as requested by DTRA. 2) An annual report shall be made to local stakeholders. 3) A stakeholder meeting shall be held annually to describe the project and the current results. Community feedback meetings shall be held to provide aggregate findings and engage with local stakeholders through the project. 4) Scientific and general reports shall be generated and presentations of findings shall be made at national and/or international meetings (e.g. ASM, ASTHM, IMED, One Health etc.) as indicated in the performance schedule below. The grantee shall attend the Annual Technical Review when invited to the review by DTRA. 5) Samples will be maintained in biobanks at KCRI and TVLA, with a subset of duplicated samples stored at UoG and PHE following confirmatory testing of these samples (Y1-OY2). Access to all samples collected and data generated during the course of the project will be maintained, up to and including at least 12 months after the project end date. 6) In Y3 a synthetic report on the cross-sectional studies will be submitted to DTRA. These dissemination pathways shall provide opportunities to gain stakeholder input, including to inform policy to reduce the threat of CCHF in Tanzania. The awardee shall submit a Research Performance Final Report and submit a Final Metrics File at the end of the entire project period.

1.5.1-OY2.5.1 Submit reports, including sample repository data, to DTRA.
1.5.2-OY2.5.2 Complete annual report to local stakeholders.
1.5.3-OY2.5.3 Host annual partners' and stakeholders' meeting.
1.5.4-OY2.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.5.5-OY2.5.5 Maintain samples in biobanks.
3.5.6 Complete reports on results of human, cattle and wildlife cross-sectional studies and comparison across the gradient.

Task OY2.6: Identify environmental correlates with CCHFV seroprevalence.

The grantee shall 1) access remote sensing data sets including the following remote sensing products: NASA's ECOSTRESS data (ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station) that provides data on vegetation water stress and LandSat data, as well as remote sensing derived data such as normalized difference vegetation index (NDVI) and enhanced vegetation index (EVI). 2) Spatially explicit correlates shall be performed to understand the relationship between environmental factors and seropositivity in humans, livestock and wildlife as well as vector and viral prevalence.

OY2.6.1 Access appropriate remote sensing data.

OY2.6.2 Conduct spatial analysis to identify correlates between environmental and ecological factors and CCHFV seropositivity.

Performance Schedule:

Task	Year 1	Year 2	Year 3	Option Year 1	Option Year 2
Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.					
1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.					
1.3 Train staff *in situ* in epidemiological field methods					
1.4 Support One Health relationships between partners and stakeholders.					
1.5 Support laboratory capacity to conduct CCHFV diagnostics.					
1.6 Host one workshop on diagnostic testing for CCHFV at each KCRI and TVLA.					
1.7 Host a workshop to support CCHF policy development in Tanzania.					
1.8 Mentor a Tanzanian post-doctoral fellow in spatial ecology of infectious diseases.					
1.9 Host East African CCHF Symposium.					
Task 2. Determine CCHFV infection patterns, risk factors and incidence in humans.					
2.2 Conduct a cross-sectional study in people within the study area.					
2.3 Conduct serological assays for the presence of anti-CCHFV antibodies					
2.4 Analyze human serosurvey results					
2.5 Conduct incidence sampling among cross-sectional study participants					
Task 3. Determine CCHFV infection patterns in cattle across varying environments.					
3.1 Obtain local permits and permissions.					
3.2 Conduct a cross-sectional serosurvey in cattle across two levels of environmental disturbance.					
3.3 Collect and identify *Hyalomma* spp. ticks from sampled cattle					
3.4 Conduct laboratory analyses on cattle ticks and sera					
3.5 Analyze cattle serosurvey results.					
Task 4. Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.					
4.1 Obtain local permits and permissions.					
4.2 Conduct cross-sectional study in small mammals.					
4.3 Collect ticks from vegetation at study sites.					
4.4 Identify ticks collected from small mammals and transects.					
4.5 Conduct laboratory analyses for CCHFV antibodies and viral RNA.					
4.6 Test banked serum from wild ungulates					
4.7 Analyze wildlife serosurvey results					
4.8 Confirm seropositive wildlife samples with virus neutralization assays					
Task 5. Disseminate reports to relevant stakeholders.					
5.1 Submit reports, including sample repository data, to DTRA.					
5.2 Complete annual report to local stakeholders.					
5.3 Host annual partners' and stakeholders' meeting.					
5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.					
5.5 Maintain samples in biobanks.					
5.6 Complete reports on results of human, cattle and wildlife cross-sectional studies and comparison across the gradient.					
Task 6. Identify environmental correlates with CCHFV seroprevalence.					
6.1 Access appropriate remote sensing data.					
6.2 Conduct spatial analysis to identify correlates between environmental and ecological factors and CCHFV seropositivity					

Budget Documentation for EHA Prime Budget for FRBAA14-6-2-0356
Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania

Table of Contents

EcoHealth Alliance Salaries

Paygroup: 5D7 Paygroup Name: Ecohealth Alliance Inc Report: Earnings Record Check Dates From : 07/11/2019 To: 06/30/2020

07/01/2019- 06-30-2020	Andre, Amanda	000083	Regular	55,706.00
07/01/2019- 06-30-2020	Karesh, William	100015	Regular	284,108.00
07/01/2019- 06-30-2020	Rostal, Melinda	100014	Regular	101,556.00
07/01/2019- 06-30-2020	Zambrana Torrelio, Carlos	100011	Regular	119,070.00
07/01/2019- 06-30-2020	Research Assistant TBD		Regular	58,500.00
07/01/2019- 06-30-2020	Post Doc/Field Coord TBD		Regular	65,000.00

Rental car vs purchase of vehicles

Holiday Autos
Your car hire to Dar International Airport - complete your booking
November 4, 2019 at 12:39 PM

holiday autos

Book now

[redacted]

Book now

$103.74 per day

Total: $3112.27

Toyota Prado or similar

first

Pick-up date:
Dar International Airport
Thu, 14 Nov 2019 12:00
Return date:
Dar International Airport
Sat, 14 Dec 2019 12:00

5 5 5

Pick-up location:
In terminal counter, shuttle to car

Fuel Policy:
Fuel: Pick up and return full.

Important information

Popular Driver Payment Insurance Supplier

Fuel policy

Full to Full

Your vehicle will be supplied with a full tank of fuel. To avoid incurring fuel charges, you will need to return it with the same amount of fuel as it had when you collected it. You may be required to leave a fuel deposit reserved or charged on your credit card, this will be released or refunded when you return the car full. Missing fuel will be charged on your return. The price per litre charged by the rental agent may be significantly higher than the price at the local service station. A refuelling charge may also be applicable.

Fuel charges are payable at the rental desk unless otherwise stated in the top section of rate details.

Mileage policy

Limited

Charge: 0.8 per kilometer. (Includes tax)

Kilometers included per day: 120

Special equipment/optional extras

Booster seat: 10 USD (Excludes tax); On request

Child toddler seat: 10 USD (Excludes tax); On request

Infant child seat: 10 USD (Excludes tax); On request

GPS: 10 USD per day. Includes 14% tax; On request

Special equipment/optional extras may be requested at the time of booking, but they are not included in the rental price. They are paid in the local currency at the rental desk.

Conditions of optional extras

Please note the following: The price of optional extras is subject to change without notice.

Kilometers included per day: 120

Special equipment/optional extras

Booster seat: 10 USD (Excludes tax): On request

Child toddler seat: 10 USD (Excludes tax): On request

Infant child seat: 10 USD (Excludes tax): On request

GPS: 10 USD per day, Includes 14% tax: On request

Special equipment/optional extras may be requested at the time of booking, but they are not included in the rental price. They are paid in the local currency at the rental desk.

Conditions of optional extras

Please note the following: The price of optional extras is subject to change without notice. Optional extras are subject to availability. Charges made at the desk may be subject to local/airport surcharges.

Travel Restrictions

All international/State cross-border travel is disallowed.

Vehicles are prohibited to enter or be driven through the National Parks and Game Reserves within Tanzania. Should the renter drive the rented vehicle into the national park, a penalty of $1000 (non-refundable) will be charged. For a comprehensive list of all National Parks and Game Reserves kindly visit the Tanzania National Parks website.

Car types

The vehicle displayed and models listed are the most common vehicles used by our car rental partners. We cannot

JAPAN TIME: Nov / 26 / 2019 07:17 AM (JST)

Hi **Your Name**

tradecarview tradecarview Sign up Log in +81 3 4570 4354 Language English Currency USD

Search from Stock Useful Links Need Help

tradecarview™

Japan's largest online used car marketplace.

Need Help?

Japan Used car / Japanese used car > Toyota > Land Cruiser Prado > 2018 > Toyota Land Cruiser Prado 2018

Specific Information Option Seller's Information Catalog

Specific information

VIN (vehicle certification Number) /Serial No	TRJ150-0084***	Full VIN/Serial No will be shown on Proforma Invoice and Invoice
Model Code	TRJ150W	
Registration Year / Month	2018/03	

2018 Toyota Land Cruiser Prado

TX

TOYOTA LAND CRUISER PRADO TX 4WD

24,205 km | Automatic | No Accident Gasoline/Petrol 2,700cc

STOCK 1 inquiries for this car

Car Price (FOB) **US$32,216**

Estimated Total Price **US$34,098**

*The price is not fixed. Let's try to negotiate!

Selected C&F + Pre-ship inspection
Nearest port DAR ES SALAAM

Change destination

1 [illegible]

Contact syuei trading ( )

I want to negotiate the best price
I want to know the shipping schedule
I want to know about the condition of the car

★ Add to Favorite **Send**

! If you do not have a login ID, please register for free first

✓ I want to receive special promotions by emails

By clicking 'Send' button, you agree to the following terms
> [illegible] Terms of Use
> [illegible]

Manufacture Year / Month	Confirm with the Seller
Mileage	24,200 km
Transmission	Automatic
Engine Capacity (Displacement)	2,700cc
Fuel	Gasoline/Petrol
BodyStyle1	SUV
BodyStyle2	-
Steering	Right
Exterior Color	Black
Interior Color	Black
Drive Type	4wheel drive
Door	5
Number of Seats	5
Dimension	476cm×189cm×185cm=16.64m³
Condition	Used
ID	5/2150 191124120615
Remarks (Any Problems)	-
Comment	Very clean interior Looks & runs great Low mileage
Expiry Date	Dec / 24 / 2019 (JST)

Options

Safety

Driver Airbag	**Anti-Lock Brakes**	**Passenger Airbag**	Alarm
Side Airbag			

Comfort

Power Steering	**A/C:front**	**Remote Keyless Entry**	Navigation System
A/C:rear	**Cruise Control**	**Digital Meter**	**Tilt Steering**

Sound System

CD Player	AM/FM Radio	AM/FM Stereo	DVD
CD Changer	Aftermarket Speaker	Hard Disc	Satellite Radio

Windows

Power Windows	**Rear Window Defroster**	**Tinted Glass**	**Rear Window Wiper**

Other Features

Power Door Locks	**Alloy Wheels**	**Power Mirrors**	Sunroof
Third Row Seats	Power Slide Door		

Other selling points

No Accident history	**Maintenance Records Available**		**One Owner**
New Tires	**Non-Smoker**	Fully Loaded	Performance Tires
Turbo	Upgraded Sound System	Custom Wheels	**Repainted Car**

Seat

Leather Seats	Power Seats	Child Seat	Bucket Seat

EcoHealth Alliance, Inc.

Materials and Supplies - Example of shipping supplies to Africa

18087

Payee DHL Airways
Vendor ID DHL
Account #:

18087
8/7/2019

Invoice	Description	Discount	Amount
ZYP0004758177	Shipping for AL to Brazzaville	$0.00	$5,010.78
	Total :	$0.00	$5,010.78

DHL Express
OUTBOUND INVOICE

DHL Express USA INC
16416 Northchase Dr
Houston TX 77060

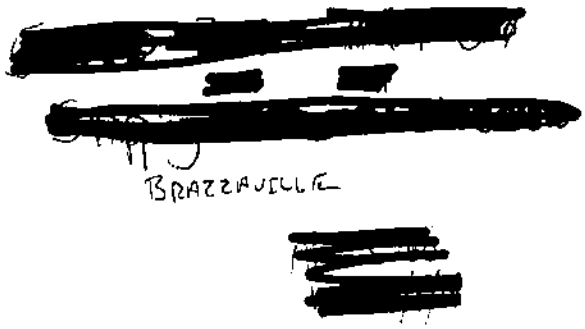
ECOHEALTH ALLIANCE
ACCOUNTS PAYABLE
460 W 34TH ST FL 17
NEW YORK NY 10001

Invoice Number: ZYP0004758177
Account Number: (b)(6)
Invoice Date: 07/31/2019
Payment Due Date: 08/15/2019
Number of Pages: 1 of 1

For Invoice Inquiries:
Telephone: 1-800-722-0081
Website: www.mybill.dhl.com

Waybill / Account / Ship Date	Prod Cd	Origin Shipper	Destination Receiver	Pcs / Wgt Cd	Tend Wgt	Billed Wgt	Extra Charge Description	Total Charge
5034391110	P	ZYP	[redacted]	4	170.00	178.00	EXPRESS WORLDWIDE NONDOC	4,537.22
8545113698		[redacted]	[redacted]		lb	lb	DUTIES TAXES PAID	15.00
07/17/2019		Ecohealth Alliance	[redacted]				NON STANDARD P CKUP	4.40
		460 W 34TH ST FL 17	[redacted]				FUEL SURCHARGE	454.16
		NEW YORK NY 10001	[redacted]	V				
			Brazzavil e Brazzaville 00000					

Description of Contents: Solar Panel Donations
Dimensions: 44.00 x 30.00 x 4.00, 44.00 x 30.00 x 4.00, 4.00 x 13.00 x 13.00, 31.00 x 23.00 x 19.00



Total Due (USD): $ 5,010.78

Weight Code: A – Customer Actual Weight V = Customer Volumetric Weight B = DHL Actual Weight W = DHL Volumetric Weight

Remit To: DHL Express - USA, 16592 Collections Center Drive, Chicago IL 60693

Federal ID: 94-3380425

Electronic Imaging Materials, Inc.
20 Forge Street Keene, NH 03431
603.357.1459 Fax: 603.357.1542
www.barcode-labels.com

Date Wed, Nov 6, 2019
Estimate No.* 756164
*This is not your part number. It will be given at first order
Account No. (b)(6)

Here is Your Custom Quotation

Customer

Mindy Rostal (212) 380-4489
EcoHealth Alliance, Inc.
460 West 34th Street
17th Floor
New York, NY 10001
US

Printer Labels

Application- 685 2.75" x 0.6875" clear Sens-A-Mark® CryoLabel®, 1.0" x 0.6875" silver

Product Size- 2.75 X 0.6875 Rectangle with 0.078125 C. Radius

Colors- Silver

Materials- Stock#685 2.0 mil Gloss Clear TT CryoLabel® Plastic W/Permanent Acrylic Adhesive
Best Used Within 12 Months Of Manufacture

See Notes.....

Finishing- Finished in Rolls of 5,000, 1 Across, on a 3" Core.
See Note, 6.2" OD

Notes-

Quantity	**50,000**
Price (1000):	$26.69
Total	$1,334.50
Grand Total	$1,334.50

SHIP DATE: 7-10 business days ARO (After Receipt of Order). Prep fees may change when design received. Valid 30 days. E-mailed POs requested; Confirmed by e-mail. All EXW (Ex Works) Keene, NH. Qty may vary +/-10% w/order considered complete. End-User responsible for thorough Product testing. **Customer is responsible for paying all applicable shipping charges, sales/use taxes and for all applicable import taxes/duties/customs fees.**

ALL SALES ARE EXPRESSLY LIMITED TO THESE TERMS AND THE TERMS AND CONDITIONS AT BARCODE-LABELS.COM/TERMS. SELLER OBJECTS TO ANY DIFFERENT OR ADDITIONAL TERMS.

Thank You,
Ed August
Account Manager

Electronic Imaging Materials, Inc.
20 Forge Street Keene, NH 03431
603.357.1459 Fax: 603.357.1542
www.barcode-labels.com

Estimate

Prepared: 11/6/2019

Estimate No. 831471
Customer PO No.

Printer, Resin and Software

Ordered By -
EcoHealth Alliance, Inc.
Attn: Mindy Rostal (212) 380-4489
460 West 34th Street
17th Floor
New York NY 10001 US

Ship To -
EcoHealth Alliance, Inc.
460 West 34th Street
17th Floor
New York, NY 10001
US
Attn: Mindy Rostal

We Would Like To Confirm Your Estimate With The Following:

Ordered	Product Number	Description	Price		Prod. Total
1	95123	Zebra ZT230 printer, 300dpi, USB & serial ports ZPL, US power cord & plug, tear bar, USB cable, 6ips, 4.09" print width	$1,290.20	Each	$1,290.20
1	95131	Zebra ZT230 printer, 300dpi, USB/parallel & Ethernet ZPL, USB cable, tear bar, US power cord & plug, 6ips, 4.09" print width	$1,625.45	Each	$1,625.45
4	T68433300	4.33" x 300 meter EIMINC® T68 premium resin ribbon note: 1 ribbon per 14,537 (685 2.75" x 0.6875") labels	$28.89	Each	$115.56
1	SEA-BTP-1	Seagull BarTender® 2019 Professional Application license plus one Printer license, includes one-year standard support	$450.45	Each	$450.45
1	MISC2	FREE, FAST, FUN, FRIENDLY & FLEXIBLE TECH SUPPORT techsupport@eiminc.com or (800) 535-6987	$0.00	Each	$0.00
1	MISC5	Shipping & handling not included. Customer is responsible for paying all applicable sales/use taxes and import taxes/duties/ customs fees.	$0.00	Each	$0.00

ALL SALES ARE EXPRESSLY LIMITED TO THESE TERMS AND THE TERMS AND CONDITIONS AT BARCODE-LABELS.COM/TERMS. SELLER OBJECTS TO ANY DIFFERENT OR ADDITIONAL TERMS.

Ed August
Sales Representative

Emily De Maria
Customer Service

15

Bag

[redacted]

Computer (with AppleCare), mouse and keyboard unit: $2126 each

Here's what's in your bag.

Get free shipping and free returns on all orders.

Magic Keyboard - US English 5 $495.00

Remove

Add a gift message Add

Order by 5pm, delivers:
Today within 2 hours - Fastest
Thu, Nov 7 - Free
Delivery options for: [redacted]

Pickup:
Today at Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray 1 $1,699.00

Show product details

Remove

AppleCare+ for MacBook/MacBook Air $249.00
Automatically registered with your Apple hardware.
Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: [redacted]

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

Magic Mouse 2 - Silver 5 $395.00

Remove

Add a gift message Add

Order by 5pm, delivers:
Today within 2 hours - Fastest
Thu, Nov 7 - Free
Delivery options for: 1000[redacted]

Pickup:
Today at Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray 1 $1,699.00

Show product details Remove

AppleCare+ for MacBook/MacBook Air $249.00
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: 1000[redacted]

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray 1 $1,699.00

Show product details Remove

AppleCare+ for MacBook/MacBook Air $249.00
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: 1000[redacted]

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray 1 **$1,699.00**

Show product details Remove

AppleCare+ for MacBook/MacBook Air **$249.00**
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: 10001

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

13-inch MacBook Air - Space Gray 1 **$1,699.00**

Show product details Remove

AppleCare+ for MacBook/MacBook Air **$249.00**
Automatically registered with your Apple hardware. Remove

Add a gift message or gift wrap Add

Order today, delivers:
Nov 15 - Nov 19 - Free
Delivery options for: 10001

Pickup:
Ships to store. Available Nov 19 at
Apple West 14th Street
Show more stores

Subtotal	$10,630.00
Shipping	FREE
Estimated tax for: 10001††	$943.41

Have a promo code? Enter it now

Total **$11,573.41**

Get 3% Daily Cash with Apple Card, or get special financing ›

A few recommendations.

ArcG

ArcGIS Pro

cGIS Pro

ɔnal use

Non-commercial use

ArcGI
Type
with t
inclu
Apps
GI

Professional User
ır team members
. GIS Professional
ArcGIS Essential
0 Service Credits.
els: Advanced,

Basic

- Create beautiful maps
- Visualize in 2D and 3D
- Analyze geographic information
- Edit and manage geospatial data
- Publish and share

$700 / year

Quantity – 0 +

Standard

- Create beautiful maps
- Visualize in 2D and 3D
- Analyze geographic information
- Enable multiuser editing
- Perform advanced geospatial data management
- Publish and share

$2,750 / year

Quantity – 0 +

Advanced

- Create beautiful maps and advanced cartographic products
- Visualize in 2D and 3D
- Analyze geographic information with advanced tools
- Enable multiuser editing
- Perform advanced geospatial data management
- Publish and share
- Utilize extensive database management tools

$3,800 / year

Quantity – 0 +

Field Supplies

Cart

Account: 884930003 EcoHealth Alliance

	Item	Price	Qty	Subtotal
	Vacutainer™ Venous Blood Collection Tubes: Vacutainer Plus™ Plastic Serum Tubes, Silicone-Coated, with Conventional Stopper Catalog number 23-021-018 **by BD 368045** Regulated **Diameter (Metric) Outer:...**	**$42.25 / Pack of 100** **$331.66 / Case of 10 PK**	9	**$2,984.94**
		In Stock (4) - Estimated delivery 11/08/2019 **On Order** (5) - Estimated delivery 11/20/2019		
	Nunc™ Biobanking and Cell Culture Cryogenic Tubes Catalog number 12-565-171N **by Thermo Scientific™ 368632** **Capacity (Metric): 1.8mL, Thread Style: Internal, Length (Metric): 49mm, Desc...**	**$241.93 / Pack of 450** **$967.73 / Case of 4 PK**	9	**$8,709.57**
		In Stock (3) - Estimated delivery 11/07/2019 **On Order** (6) - Estimated delivery 11/20/2019		

Order Summary

Subtotal	$61,326.04
▲ Shipping and Handling *	$1,134.08
Hazardous material charge	$23.25
Shipping fuel surcharge	$4.45
Shipping charge	$1,106.38
Estimated Tax	$0.00

*Extra charges may apply for products that require special services.

*Additional handling charges determined by direct ship manufacturers may apply.

Generate a Web Quc

View All Quotes | What's this?| FAQ

	Item	Price	Qty	Subtotal
	Vacutainer™ Venous Blood Collection Tubes: Vacutainer Plus™ Plastic Serum Tubes, Silicone-Coated, with Conventional Stopper Catalog number 02-657-27 **by BD 366668** Regulated **Diameter (Metric) Outer:...**	**$34.00 / Pack of 100** **$261.62 / Case of 10 PK**	3	**$784.86** ●
	In Stock (3) - Estimated delivery 11/07/2019			
	PC MTUBE 1.3ML SERUM/PK100 Catalog number NC9444309 **by Sarstedt Inc** **41.1501.105**	**$36.50 / Pack of 100**	10	**$365.00**
	Ships from manufacturer - Usually Ships in 2 Business Days			
	Vacutainer™ Tube Holder Catalog number 22-289-953 **by BD 364815** Regulated **HLDR 1-USE NOSTCKBL 250/PK RX**	**$22.99 / Pack of 250** **$91.90 / Case of 4 PK**	5	**$459.50** ●
	In Stock (5) - Estimated delivery 11/07/2019			
	Vacutainer™ Eclipse™ Blood Collection Needle Catalog number 02-683-101 **by BD 368607** Regulated **Gauge: 21g, Includes: Built-in safety shield, Color: Green hub**	**$42.55 / Pack of 48** **$339.50 / Case of 10 PK**	5	**$1,697.50** ●

Item	Price	Qty	Subtotal
	In Stock (5) - Estimated delivery 11/07/2019		
 Monoject™ Supra/Hone™ Thin Wall Blood Collection Needles Catalog number 22-030573 **by Covidien 8881216066** Regulated **Needle Gauge: 22 G**	**$31.83 / Pack of 100** **$270.89 / Case of 10 PK**	2	**$541.78**
	On Order (2) - Estimated delivery 12/13/2019		
3cc Syringes Catalog number 14-840-77 **by Exel International 26200** Regulated **Termination: Luer-lock**	**$24.00 / Pack of 100** **$196.73 / Case of 10 PK**	3	**$590.19**
	In Stock (2) - Estimated delivery 11/07/2019		
	On Order (1) - Estimated delivery 11/21/2019		
 Monoject™ Softpack Hypodermic Needles with Polypropylene Hub Catalog number 05-561-22 **by Covidien 8881250222** Regulated **Needle Gauge: 22 G, Length (English) Needle: 1 in., Length (Metric) Needl...**	**$25.86 / Pack of 100** **$218.36 / Case of 10 PK**	3	**$655.08**

Item	Price	Qty	Subtotal
	In Stock (1) - Estimated delivery 11/11/2019 **On Order** (2) - Estimated delivery 11/26/2019		
Syringe with Sub-Q Needle Catalog number 14-829-10F **by BD 309597** Regulated **SYRINGE TB 26GX58 1CC 100PK RX**	**$35.25 / Pack of 100** **$213.21 / Case of 8 PK**	2	**$426.42**
	In Stock (2) - Estimated delivery 11/07/2019		
Graham Field Thumb Dressing Forceps Catalog number 19-027503 **by Graham-Field™ 2750** **Length (English): 5 in.,** **Length (Metric): 127 mm**	**$9.00 / Each**	4	**$36.00**
	On Order (4) - Estimated delivery 12/13/2019		
Fisherbrand™ 50mL Graduated Polypropylene Centrifuge Tube Catalog number 14-375-150 **CENT TB FREESTNDNG 50ML 500/CS**	**$415.00 / Case of 500**	6	**$2,490.00**
	In Stock (6) - Estimated delivery 11/07/2019		

Biosafety Equipment

	Item	Price	Qty	Subtotal
	Fisherbrand™ Extended Cuff Nitrile Exam Gloves Catalog number 19-041-170D **Size: X-Large**	**$39.05 / Pack of 50** **$332.50 / Case of 10 PK**	5	**$1,662.50**
	In Stock (5) - Estimated delivery 11/07/2019			
	Fisherbrand™ Extended Cuff Nitrile Exam Gloves Catalog number 19-041-170B **Size: Medium**	**$39.05 / Pack of 50** **$332.50 / Case of 10 PK**	7	**$2,327.50**
	On Order (7) - Estimated delivery 11/15/2019			
	Fisherbrand™ Extended Cuff Nitrile Exam Gloves Catalog number 19-041-170A **Size: Small**	**$39.05 / Pack of 50** **$332.50 / Case of 10 PK**	4	**$1,330.00**
	In Stock (4) - Estimated delivery 11/07/2019			
	Sharps Disposal Containers Catalog number 14-830-124 **by Covidien 8970** **Capacity (English): 2 gal.,** **Capacity (Metric): 7.6 L,** **Closure Type: Rotor Lid**	**$228.33 / Case of 20**	3	**$684.99**

Item	Price	Qty	Subtotal

In Stock (3) - Estimated delivery 11/07/2019

Red Color Polyethylene Liner Printed with BioHazard Symbol, 2 mil Thick, 16 x 14 x 36 Inch Bags, 50 per Package
Catalog number 50-998-764
by Research Products International Corp 246107

$38.13 / Pack of 50 | 3 | **$114.39**

Ships from manufacturer - Usually Ships in 1 Business Days

KleenGuard™ A60 Bloodborne Pathogen and Chemical Splash Protection Coveralls
Catalog number 19-057-404B
by Kimberly-Clark Professional™ 45023
Closure Type: Zipper front, Description: Hooded, seamless zi...

$470.00 / Case of 24 | 22 | **$10,340.00**

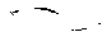
On Order (22) - Estimated delivery 12/10/2019

KleenGuard™ A60 Bloodborne Pathogen and Chemical Splash Protection Coveralls
Catalog number 19-057-404A
by Kimberly-Clark Professional™ 45022
Closure Type: Zipper front, Description: Hooded, seamless zi...

$470.00 / Case of 24 | 23 | **$10,810.00**

In Stock (10) - Estimated delivery 11/07/2019

On Order (13) - Estimated delivery 12/10/2019

	Item	Price	Qty	Subtotal
	Comfort Plus Disposable Filtering Facepiece Respirator, N95 Catalog number 19-120-299 **by 3M™ 8211** **Certifications/Compliance: NIOSH 42 CFR Part 84, N95, NIOSH TC-84A-1299, Design T...**	**$44.41 / Pack of 10** **$314.00 / Case of 8 PK**	14	**$4,396.00**
	In Stock (3) - Estimated delivery 11/07/2019 **On Order** (11) - Estimated delivery 11/27/2019			
	Qualitative Fit-Test Kit, Bitter Catalog number 19-002-720 **by 3M™ FT30** **Product Type: Bitter Fit Test Kit, Quantity: 1**	**$436.00 / Each**	1	**$436.00**
	In Stock (1) - Estimated delivery 11/11/2019			
	Metaliks™ Eyewear Catalog number 19-810-520 **by 3M™ 115540000020** **Frame Color: Bronze, Lens Type: Anti-fog, Lens Tint: Clear**	**$32.30 / Each** **$282.50 / Case of 20 EA**	10	**$323.00**
	On Order (10) - Estimated delivery 12/06/2019			

	Item	Price	Qty	Subtotal
	Ethanol, 70% Solution, Molecular Biology Grade, Denatured, Fisher BioReagents™ Catalog number BP82031GAL **Quantity: 1 gal., Packaging: Poly Bottle**	**$82.00 / Each** **$264.00 / Case of 4 EA**	1	**$82.00** ●

On Order (1) - Estimated delivery 11/11/2019

Items for Building TVLA Capacity

	TSG Series Countertop Refrigerator Catalog number TSG205SA **by Thermo Scientific™ TSG205SA** **TSG CT SOLID DOOR, 5-15P**	**$2,740.00 / Each**	1	**$2,740.00**

Ships from manufacturer - Usually Ships in 3 Business Days

	Fisherbrand™ Traceable™ Refrigerator/Freezer Plus Thermometer Catalog number 15-077-721 **5ML VACCN THRMTR .5 DEG 1EA**	**$101.00 / Each**	1	**$101.00**

On Order (1) - Estimated delivery 11/21/2019

	Lamp Assembly for FLx800™ Microplate Reader Catalog number BT7080500 **by BioTek™ 7080500** **LAMP ASSEMBLY FOR FLX800**	**$174.10 / Each**	1	**$174.10**

This item is not returnable. View return policy

Ships from manufacturer - Usually Ships in 5 Business Days

	Item	Price	Qty	Subtotal
	LMC-2000 Series Compound Microscope Catalog number LMC2PH1 **by Laxco™ LMC2PH1** **Head Style: Binocular, Lighting Type: 3w LED, Phase Contrast, Magnification Power: 10X, 20X, 4...**	**$3,347.30 / Each**	1	**$3,347.30**
		Ships from manufacturer - Usually Ships in 18 Business Days		
	[DW-20] Deionized Water Distiller with Gauge Catalog number 50-187-1175 **by Labomed Inc DW20**	**$2,458.50 / Each**	1	**$2,458.50**
		Ships from manufacturer - Usually Ships in 40 Business Days		
	24006 ISFET POCKET PH METER Catalog number NC1478483 **by Deltatrak Inc 24006**	**$257.92 / Each**	1	**$257.92**
		Ships from manufacturer - Usually Ships in 2 Business Days		

Add all items to a list

CappWash™ Microplate Washer, APS BE

APS BE

CappWash™ is the ideal washing tool for small scale immunoassays

- Compact and made for small-scale work
- Unique two-in-one design
- Simple washing matches all well types
- No programming and no electrical wiring connection required

The vacuum pump is available for 115V connections

Fitting into even the tightest budget, CappWash™ is a perfect alternative for washing micro plates and strips

Order Now

ORDER Grid A

Add to Cart

	Description	Supplier No.	VWR Catalog Number	Unit	Availability	Price	Quantity
	CappWash™ Kit, Includes W-12, WP-115V, WB-1, WB-3, WB-4, and W-1000 (3 meters)	W-12KIT-115V	490015-894	Each	Ordered Upon Request	$2,513.48	0

Add to Cart

Customize Barcode Label Format: Avery 5161 1" x 4"

Save Style as Default Catalog Page

Add to Shopping List Add to Quote

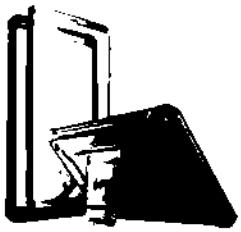
Existing List or New List

Enter List Name:

Tablets and case: $228.98 each

Shopping Cart

Price



SupCase Unicorn Beetle Pro Series Designed for Galaxy Tab A 10.1 (2019 Release), Full-Body Rugged Heavy Duty Protective Case with Built-in Screen Protector for Galaxy Tab A 10.1 Inch 2019 (Black) $26.99

In Stock
Eligible for FREE Shipping
This is a gift Learn more
Qty: 8 Delete Save for later
Compare with similar items

Samsung Galaxy Tab A 10.1 32 GB Wifi Tablet Black (2019) $201.99

In Stock
Eligible for FREE Shipping
Gift options not available. Learn more
Qty: 5 Delete Save for later
Compare with similar items

Note we will order 8, only 5 were allowed to be ordered at a time. This adds another $605.97 to the total

Subtotal (13 items): $1,225.87
Updated Subtotal (16 items): $1,831.84

The price and availability of items at Amazon.com are subject to change. The Cart is a temporary place to store a list of your items and reflects each item's most recent price. Learn more
Do you have a gift card or promotional code? We'll ask you to enter your claim code when it's time to pay.

Subtotal (13 items): $1,225.87

This order contains a gift

Proceed to checkout

Sponsored Products related to items in your cart

Fire HD 10 Case 2017...
26
$29.99
See all buying options

Galaxy Tab A 10.1 Case...
14
$16.99
See all buying options

Amazon Fire 7 Tablet...
1,625
$14.99
See all buying options

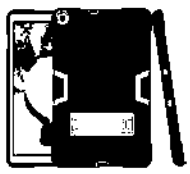
Soke Galaxy Tab A...
296
$19.99
See all buying options

Customers who shopped for SupCase Unicorn Beetle Pro Series Designed for... also shopped for:

Page 1 of 4

SupCase [Unicorn Beetle...
675
$26.99
Add to Cart

Galaxy Tab A 10.1 2019...
122
$26.95
Add to Cart



Cartis Galaxy Tab A 10.1"...
173
$13.99
Add to Cart

Gift ideas inspired by your shopping history

Traps

Tomahawk Live Trap

All categories > Search products

Home > Cart contents

Ordering multiple items? We may be able to reduce shipping cost for your order. Please read this memo. Thank you!

If you are ordering many different items our website may not accurately calculate shipping for you. We can combine products and ship them together in boxes to save shipping cost. During the final stage of the checkout process select the "Double Check My Shipping Cost" option as your payment method. We will contact you with a quote for reduced shipping. You can also call us at 800-272-8727 and we can quote you by phone.

CART CONTENTS

CONTINUE SHOPPING

CLEAR CART

PROCEED TO CHECKOUT

LFAHD - 9 x 3 x 3.5 - Folding, Aluminum Trap ⊗

CODE: LFAHD

$27.23

- 33 +

$898.59

200 - Collapsible Squirrel Trap with Two Trap Doors ⊗

CODE: 200

ADD POWDER COATING. :

(+15%)

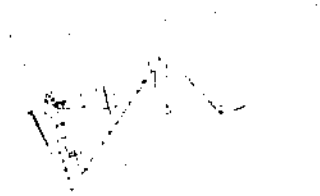
ADD A PLASTIC TRAP COVER FOR THIS TRAP. ❓:

(+$16.45)

$44.82

- 40 +

$1,792.80



205 - Collapsible Cat, Opossum, Rabbit Trap with One Trap Door ⊗

CODE: 205

ADD POWDER COATING. :

(+15%)

ADD A PLASTIC TRAP COVER FOR THIS TRAP. ❶:

(+$25.95)

$63.45

− 60 +

$3,807.00

Gift certificate or promo code [redacted]

Subtotal	$6,498.39
FedEx (✈ CHANGE)	$357.54
TOTAL COST	**$6,855.93**

Tattoo kit to mark hares

Add $17.68 of eligible items to your order to qualify for FREE Shipping. See details

Subtotal (3 items): $85.32

Proceed to checkout

Shopping Cart

Price

Speedball 2-Ounce India Ink, Super Black $7.32
In Stock
Eligible for FREE Shipping
Gift options not available. Learn more
Qty: 1 Delete Save for later
Compare with similar items

Grand Champion 1/4 inch Tattoo 0-9 $15.00
In Stock
Shipped from: BUNNYRABBITcom
Gift options not available. Learn more
Qty: 1 Delete Save for later

Grand Champion 1/4 inch Tattoo Kit with Case $63.00
Only 10 left in stock - order soon.
Shipped from: BUNNYRABBITcom
Gift options not available. Learn more
Qty: 1 Delete Save for later

Samsung Galaxy Tab A 10.1 32 GB Wifi Tablet Black (2019) was removed from Shopping Cart.

Subtotal (3 items): $85.32

The price and availability of items at Amazon.com are subject to change. The Cart is a temporary place to store a list of your items and reflects each item's most recent price. Learn more
Do you have a gift card or promotional code? We'll ask you to enter your claim code when it's time to pay.

Your recently viewed items

Samsonite Ripstop 179
$113.87
Add to Cart

Samsonite Solyte DLX //
$109.12
Add to Cart

Samsonite Solyte DLX //
$166.99
Add to Cart

American Tourister Belle 278
$92.36
Add to Cart

Sponsored Products related to items in your cart What's this?

Page 1 of 3

ZZKOKO Calligraphy Ink Bottle, 12 Colors Dip

Daveliou Pink Calligraphy Pens Set - 17 Piece Kit

Kent Scientific

Rodent Ear tags

Products

Items (1)

Laser Etched Ear Tags, One-Sided

1,000 Laser Etched Ear Tags (Custom Specified Numbering)

Item #: INS1005-1LSZ

$315

1

× Remove

Save for later

$315

Update Cart

Summary

Subtotal: $315

Shipping and tax will be calculated when we process your order and will be added to the amount you are charged.

Total: **$315**

email

password

Login To Checkout

Forget your password?

Checkout as Guest ›

Discount Code

Apply

Anesthesia Machine

Shopping Cart

	Product Name	Move to Quote	Unit Price	Qty	Subtotal
(https://www.harvardapparatus.com/universal-rebreathing-anesthesia-f-circuit-1.html)	Universal F Circuit, 60 in (https://www.harvardapparatus.com/universal-rebreathing-anesthesia-f-circuit-1.html)		$30.00	1	$30.00
 (https://www.harvardapparatus.com/tabletop-anesthesia-systems.html)	Harvard Apparatus Single Animal Tabletop Isoflurane Anesthesia System with Small Induction Box (https://www.harvardapparatus.com/tabletop-anesthesia-systems.html)		$2,963.00	1	$2,963.00
 (https://www.harvardapparatus.com/cat-anesthesia-masks.html)	Cat Ventilation/Anesthesia Mask, Small, 5.1 cm (2 in) diameter, molded on 15 mm standard male connections (https://www.harvardapparatus.com/cat-anesthesia-masks.html)		$15.00	1	$15.00

Continue Shopping Update Shopping Cart

Estimate Shipping and Tax

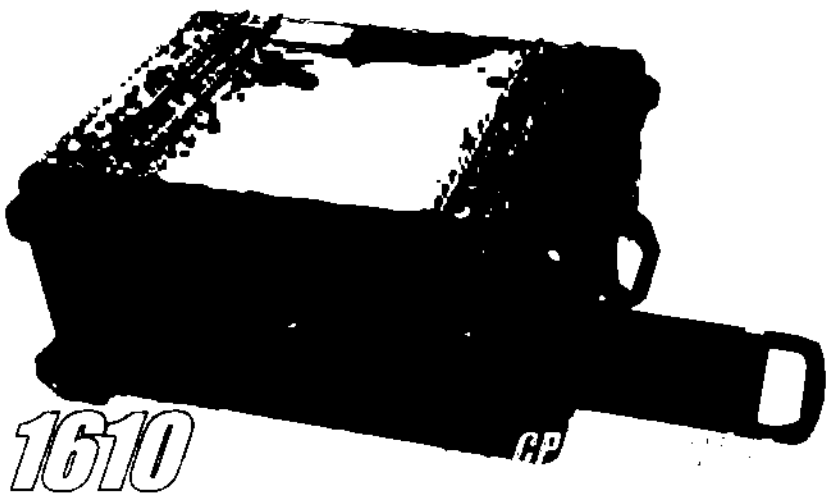
Discount Codes

Enter your coupon code if you have

Subtotal	$3,008.00
Grand Total	**$3,008.00**

Pelican Case 1610

Order your pelican case now! 1-800-882-4730



22.25"L x 17.12"W x 7" Lid over 8.5" Base

24.56"L x 19.31"W x 11.93"H

Empty 20 lbs. Case with Foam: 22.5 lbs

120 lbs

AVAILABLE COLORS

BLACK DESERT TAN OD GREEN

TAN & OD GREEN PLEASE CHECK AVAILABILITY

Pelican 1610 roll model case

With Fold Down Handle & Wheels. Available in **Black and** ready for shipping in 24 hrs. or less. **Desert Tan** and **OD Green** colors are available upon request (longer lead time and minimum quantities applies)

SMALLER Click LARGER

Case to carry anesthesia machine

1610 Case Part Numbers:

APP-1610E
Price $215.95

BUY!

IN STOCK

Empty case, no foam (E suffix) (No re stocking charge applies)

Strong yet rigid on the inside, suitable for rugged equipment that does not require additional foam protection.

APP-1610F
Price $256.95

BUY!

IN STOCK

Foam Filled (F suffix) Pick "N" Pluck
Polyurethane layers, 3 pcs are Pick "N" Pluck 2.38" thick, one base pad and one convoluted egg crate foam lid pad.
(No re stocking charge applies)

APP-1614PD
Price $332.14

BUY!

Pelican case 1614 with **Padded Dividers**
(No re stocking charge applies)

Available in five compartments, you get: Made of durable nylon and foam. Individual compartments are adjustable using a hook and loop Velcro system.

Anesthesia Medications

CHECKOUT

1 SHOPPING CART — 2 PROMOTIONS (/MY-ACCOUNT/CHECKOUT?S=PROMOTIONS) — 3 PAYMENT & DELIVERY OPTIONS (/MY-ACCOUNT/CHECKOUT?S=CONFIRMATION) — 4 COMPLETED

Load Items from Saved Order

Navigate to Saved List

SAVE ORDER (/MY-ACCOUNT/CHECKOUT?S=SAVE) CLEAR CART

CHECKOUT (/MY-ACCOUNT/CHECKOUT?S=PROMOTIONS)

Estimate total: **$3,072.98**

(/Product?sku=029405)

ISOTHESIA (ISOFLURANE) SOLUTION

Availability This item is scheduled to arrive the next business day. It is not for transportation by air.

Brand Products
Practice Preferred

Unit Price $27.83
Unit Total $1,141.03

41 REMOVE ()

SKU	029405
Size	250mL
Case Qty	6
In Stock	In Stock: 1620

CONSUMER COMMODITY ORM-D

(/Product?sku=029404)

ISOTHESIA (ISOFLURANE) SOLUTION

Availability This item is scheduled to arrive the next business day. It is not for transportation by air.

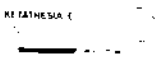
Brand Products
Practice Preferred

Unit Price $17.82
Unit Total $1,283.04

72 REMOVE ()

SKU	029404
Size	100mL
Case Qty	6
In Stock	In Stock: 116

CONSUMER COMMODITY ORM-D



KETATHESIA INJECTION, 100MG/ML C3N

DIAZEPAM INJECTION, 5MG/ML, C4

Equipment

Cart

Account: 884930003 EcoHealth Alliance

	Item	Price	Qty	Subtotal
	Sorvall™ ST 16 Centrifuge Series Catalog number 75-004-240 **by Thermo Scientific™ 75004240** **Description: Sorvall ST 16 Centrifuge, Capacity: 4 x 400mL, Electrical Requirements: 230V 50/60Hz**	**$6,680.00 / Each**	1	**$6,680.00**
	Ships from manufacturer - Usually Ships in 27 Business Days			
	Fisherbrand™ Isotemp™ -86°C Ultra-Low Temperature Chest Freezers, 20 cu. ft. Catalog number 13920CD **Electrical Requirements: 208 - 230 V 60 Hz**	**$15,630.00 / Each**	1	**$15,630.00**
	Ships from manufacturer - Usually Ships in 35 Business Days			

Add all items to a list

Order Summary

Subtotal	$22,310.00
▲ Shipping and Handling *	$424.99
Shipping charge	$424.99
Estimated Tax	$0.00

*Extra charges may apply for products that require special services.

*Additional handling charges determined by direct ship manufacturers may apply.

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Melinda Rostal DVM, MPH
Senior Research Scientist

PREDICT 2 Surveillance Coordinator for EcoHealth Alliance
EcoHealth Alliance
460 West 34th Street, Suite 1701
New York, NY 10001

1.212.380.4489 (direct)
www.ecohealthalliance.org

November 20th, 2019

Generator

Genset Model
C22 D5, 22kVA Standby, 20kVA , Diesel, Open

Bill of Material

Emergency Standby Power (ESP)
Emissions Level : No Certification
Local Codes and/or Regulation : CE
Output Voltage : 200/115, 3 Phase, Wye, 4 Wire
Engine
X2.5G2
Engine Air Cleaner - Duty Rating : Heavy Duty
Engine Oil Heater : None Supplied
Engine Speed Governing : Mechanical Droop Governor
Engine Coolant Heater : None Supplied
Sub-Base Anti-Vibration Mounts
None Supplied
Main Generator
S0L2G1, 50 Hertz (Hz), 200V and 400V, 163C, Emergency Standby Power (ESP)
Generator Accessories
Voltage Regulator - Torque Match
Main Generator Heater : None Supplied
Exhaust System
Silencer Grade : Residential, Flange On Connection Inlet 3 Inch, Outlet 3 Inch, Side Entry
Exhaust System Accessories : Bellows, System Fixing Kit
Cooling System
Genset Mounted Radiator, 50C / 122F, Genset Mounted
Engine Coolant Mixture : 50% Antifreeze, 50% Water
Primary Electrical Isolation Device
One Circuit Breaker
Primary Electrical Isolation Device
80A MCB, 440V IEC, 4 Pole, 100%, Left
Entrance Box / Terminal Housing
Cable Entrance Box Required : None Supplied
Control System Options
PowerStart 0600
Control Panel Mounting (Viewed From Generator End) : Left Facing

Control Language : English
Warning - Low Battery Voltage
Emergency Stop Switch - External
Control Cabinet Heater : None Supplied
Starting Batteries
Pure Lead-Tin Thin Plate Valve Regulated Lead-Acid (VRLA) Battery - Maintenance Free
Battery Charger
Set Mounted, 6A, 110 - 240 V
Genset Testing
Genset Testing : Standard Factory Test
Test Records : Certified Test
Warranty
Standby, 40 Months, 800 Hours
Literature Language
English
Packing
Cover - Shipping

Net package price, ... $ 7.900.00 + applicable taxes

Notes:

1. Spec sheet provided to quote
2. Price includes freight Factory via standard ground to nearest port of generator manufacturer, Shipping to final destination Tanzania by others and not included in this quote.
3. Price does not include field connections, installation or rigging.
4. This proposal is based on information supplied to Cummins which may or may not have been correct or complete. The customer is responsible for reviewing this proposal for compliance with the complete and final drawings and specifications.
5. All quotations automatically expire thirty (30) days from date issued.

We thank you for giving us the opportunity to quote this equipment. If you need any further assistance or clarification, please do not hesitate to contact us

Sincerely,

Colm Kelly

Senior Sales Representative

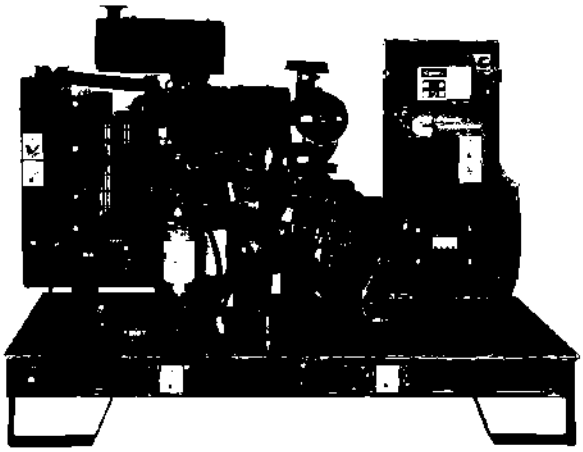
Specification sheet

BOM for our standard C22D5 Open type @50Hz using the X2.5 engine.

Diesel generator set X2.5 series engine

15 kVA - 28 kVA 50 Hz

10.8 kW - 20 kW 60 Hz



Description

This Cummins® commercial generator set is a fully integrated power generation system, providing optimum performance, reliability, and versatility for Stationary Standby, Prime Power, and Continuous Duty applications.

Features

Cummins heavy-duty engine - Rugged 4-cycle industrial diesel delivers reliable power, low emissions and fast response to load changes.

Optional excitation boost system (EBS) - Offers enhanced motor starting and fault clearing short circuit capability.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings; low waveform distortion with non-linear loads and fault clearing short-circuits capability.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Control system - PowerStart control, microprocessor-based generator set monitoring and control system provides a simple operator interface to the generator set, manual and remote start/stop control and shutdown fault indication.

Enclosures - Optional weather-protective and sound-attenuated enclosure.

Warranty - Backed by a comprehensive warranty and worldwide distributor network.

	3-Phase ratings				1-Phase ratings*				
	Standby rating		Prime rating		Standby rating		Prime rating		Data sheet
Model	50 Hz kVA (kW)	60 Hz kW (kVA)	50 Hz kVA (kW)	60 Hz kW (kVA)	50 Hz kVA (kW)	60 Hz kW (kVA)	50 Hz kVA (kW)	60 Hz kW (kVA)	
C17 D5	16.5 (13)		15 (12)		13 (13)		11.8 (11.8)		DS338-CPGK
C22 D5	22 (18)		20 (16)		17 (17)		15.5 (15.5)		DS340-CPGK
[illegible]	[illegible]		25 (20)		22 (22)		20 (20)		DS342-CPGK
C12 D6		12 (15)		10.9 (13.6)		12 (12)		10.9 (10.9)	DS339-CPGK
C16 D6		16 (20)		15 (18)		16 (16)		14.5 (14.5)	DS341-CPGK
C20 D6		20 (25)		18 (22)		20 (20)		18.1 (18.1)	DS343-CPGK

*1.0 PF

Generator set specifications

Governor regulation class	ISO 8528 G2
Voltage regulation, no load to full load	± 2.5%
Random voltage variation	± 2.5%
Frequency regulation	Droop
Random frequency variation	± 0.75 %
Radio frequency emissions compliance	BS EN 61000-6-1 / BS EN 61000-6-3

Engine specifications

Design	4 cycle, in-line, naturally aspirated
Bore	91.4 mm
Stroke	127 mm
Displacement	2.5 liter (153 in^3)
Cylinder block	Alloy cast iron, in-line, 3 cylinder
Battery charging alternator	36 A
Starting voltage	12 volt, negative ground
Fuel system	Direct injection
Fuel filter	Spin on fuel filters with water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Spin on full flow filter, filtration efficiency 25 micron 99% (min)
Standard cooling system	122 °F (50 °C) ambient radiator with coolant recovery system

Alternator specifications

Design	Brushless, single bearing
Stator	2/3 pitch
Insulation system	Class H
Standard temperature rise	125-163 °C
Exciter type	Self excited
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform Total Harmonic Distortion (THDV)	No load to full linear load < 5%. For any single harmonic < 2.5%
Telephone Influence Factor (TIF)	< 75 (for 60 Hz)
Telephone Harmonic Factor (THF)	< 2% (for 50 Hz)

Available voltages

50 Hz Line–Line/Line-Neutral			60 Hz Line–Line/Line-Neutral		
3-phase		1-phase	3-phase		1-phase
• 416/240 • 400/230 • 380/220	• 208/120 • 200/115 • 190/110	• 230 •	• 480/277 • 440/255 • 416/240	• 220/127	• 240 •

Note: Consult factory for other voltages.

Generator set options

Engine
- Electronic engine governing
- Coolant heater 120/240 V

Cooling
- Antifreeze 50/50 (Ethylene glycol)

Enclosure
- Optional silent power canopy

Base frame
- Dual skin fully contained fuel tank
- 500 litre fuel tank
- Set mounted battery

Alternator
- Alternator heater
- Control panel
- PowerCommand 1.1
- 2/4 pole main circuit breaker
- Aux 101

Warranty
- 2 years for Prime application
- 5 years for Standby application

- 1500/3000 hours service kit
- Optional language literature
- Engine oil heater 120/240 V
- External fuel fill (3 way valve)

Note: Some options may not be available on all models - consult factory for availability.

Control system

Generator set control PowerStart 600 – The PowerStart contol is a microprocessor-based generator set monitoring and control system. The control provides a simple operator interface to the generator set, auto/ manual and remote start/stop control and shutdown fault indication. The integration of all control functions into a single control provides enhanced reliability and performance compared to conventional generator set control systems. This control has been designed and tested to meet the harsh environment in which gensets are typically applied.

- The PowerStart generator set control is suitable for use on a wide range of generator sets in non-paralleling applications. It is suitable for use with reconnectable or non-reconnectable generators, can be configured for either 50 Hz or 60 Hz and voltage and power connection from 190-600 VAC line-to-line.
- This control includes an intuitive operator interface that allows for complete genset control as well as system metering, fault annunciation, maintenance alarm, over imbalance current, configuration and diagnostics. The interface includes seven generator set status LED lamps with both internationally accepted symbols and English text to comply with customer needs. The interface also includes an LED backlit LCD display with tactile-feel soft-switches for easy operation and screen navigation. The manual/auto/stop switch function is integrated into the interface panel.
- All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.
- Power for this control is derived from the generator set starting batteries and functions over a voltage range from 8VDC to 16 VDC.

Major Features

- Integrated 128x64 Pixel monochrome graphic LCD Display
- 12 and 24V battery operation
- Genset monitoring-monitor status of all critical engine and alternator functions
- Digital genset metering (AC and DC)
- Genset battery monitoring system to warn against a weak battery connection
- Configurable for single phase or three phase or split phase AC metering
- Engine starting includes solid state output to operate external relay to start the engine, fuel shut off (FSO) and glow Plug
- Genset Protection: protects engine and alternator
- Real time clock for fault and event stamping
- Fuel level measurement using 4-20mA input sensor
- Exerciser clock and time of delay start/stop initiate a test without load.
- Maintenance due alarm based on engine running time and real time clock
- Auto Main Failure (AMF) Provides load transfer operation in open transition mode
- AMF Test with or without load options
- Utility Voltage monitoring and protection
- Remote start capability in Auto mode
- Advanced service ability using Inpower™ a PC based Software service tool
- Modbus interface for interconnecting to customer PLC/BMS
- Configurable Inputs and Outputs
- Environmental protection: The Control is designed for reliable operation in harsh environment
- Warranty and service backed by a comprehensive warranty and worldwide distributor service network
- Certification-suitable for use on generator sets that are designed, manufactured, tested and certified relevant ISO, IEC and CE standards.

Base control functions

LCD capability

LED INDICATING LAMPS

- For Genset Running, Remote Start, AMF Test Active, Genset Shutdown, Warning, Load connected to Genset, Load connected to Utility, Manual Mode, Stop Mode and Auto Mode.

LCD display

- 128 x 64 Pixel Monochrome Graphics display

OPERATION INTERFACE

Six tactile-feel soft switches for LCD navigation, genset operation and control setup. These switches are indicated by internationally accepted symbols and English text.

OPERATOR ADJUSTMENTS

- The LCD includes provisions for necessary set up and adjustment functions.
- Data Log includes engine run time and controller ontime Fault History.
- Provides a record of the most recent fault Condition with Engine run time stamp, RTC stamp and occurances
- Up to 5 events are stored in the control non-volatile memory.

AMF FUNCTIONALITY

When Auto Mains Failure is enabled and controller is in Auto Mode and if utility goes off then control starts the Genset automatically and transfers load onto Genset. If Utility returns and is healthy then load again gets retransferred onto Utility. AMF provides load transfer operation in Open Transition transfer mode.

FUEL LEVEL FEATURE

The Control will show the warning fault when the fuel level in the tank goes below the predefined threshold. Control includes time delays to prevent nuisance warning signals.

Exercise Scheduler

It is used only when genset is in Auto mode. It is used to start a Scheduler schedule at No Load condition. A trim Exercise Scheduler Enable is available to enable or disable the feature.

Maintenance

Maintenance due alarm based on Engine Running Time or Real time clock

Control data

Access to the control software part number and software version are provided from the LCD or InPower™.

Alternator data

- Voltage (single or three phase line-to-line and line-to- neutral)
- Current (single or three phase)
- kVA, kVAR, kW, Power Factor (Three phase and total)
- Frequency
- Totalized positive and negative kWH, kVARH, kVAH

Utility AC data

- Voltage (three/single phase LL and LN) - Frequency

ENGINE DATA

- Starting battery voltage
- Engine running hours
- Engine temperature
- Engine oil pressure

Service adjustments

- The control includes provisions for adjustment and calibration of generator set control functions. Functions include:
- Voltage selection
- Frequency selection
- Genset and Utility AC Meter Calibration

ENGINE CONTROL

- CT ratio, and Genset ratings setup
- Start/Stop time delay setup
- Real time clock setup with daylight saving
- AMF Setup with test mode and transfer/retransfer time delays
- Modbus baud rate, parity setup
- Exercise scheduler repeat interval, Day, time and duration setup
- Maintenance due setup
- LCD brightness and contrast control

Battery operation

- Control will operate on 12V/24V batteries

Auto start mode

Accepts a ground signal from remote devices to automatically start the generator set. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Emergency stop

The control annunciates when an emergency stop signal is received and the generator set immediately shuts down. The generator set is prevented from running or cranking with the switch engaged E-stop switch.

Sleep mode

The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating.

Engine starting

The control supports automatic engine starting. Primary and backup start disconnects are achieved by battery charging alternator feedback or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking

Configurable for the number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

Time delay start and stop (cooldown) Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for

time delay of 0-600 seconds prior to shutdown after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

Auto Mains Failure functions

AMF primarily means that the genset controller is controlling both the genset breaker and a utility breaker in a transfer pair arrangement. AMF is only for use in a single genset / single utility arrangement. AMF's primary job is to keep loads powered. AMF completely manages the system by automatically starting the genset and transferring load when it detects utility failure. AMF has numerous built-in configurable sensors to determine the availability of the utility and genset sources. Sensors include under voltage, overvoltage, over/under frequency and breaker failure. PS0600 control supports only open transition (Break before Make) AMF functionality.

AMF Test mode

AMF supports test mode with or without load options along with test mode duration.

Load Transfer Switch Type

AMF breaker outputs can be continuous (contact pair) or pulsed (GTEC) type based on load transfer switch selection.

Undervoltage sensor

- Three phase LL and LN undervoltage sensing for pickup 85-100% and dropout adjustable from 75-98% of nominal and dropout adjustable delay from 0.1-30 sec

Overvoltage sensor

- Three phase LL and LN overvoltage sensing for dropout adjustable from 105-135% of nominal and dropout adjustable delay from 0.5-120 sec

Over/under frequency sensor

- Underfrequency sensing for pickup 85-100% and dropout adjustable from 70-85% of nominal and dropout adjustable delay from 0.1-15 sec
- Overfrequency sensing for dropout adjustable from 105-115% of nominal and dropout adjustable delay from 0.1-15 sec

Timers

- Control provides transfer time delays including Time delay engine start (0-3600 sec), time delay normal to emergency (0-300 sec) and programmed transition delay (0-600 sec). impending failure.

- **Cranking lockout** - The control will not allow the starter to attempt to engage or to crank the engine when the engine is running.

- Control provides retransfer time delays including time delay emergency to normal (0-1800 sec) and programmed transition delay (0-600 sec), time delay engine cooldown (0-3600 sec)

Protective functions:

On operation of a protective function, the control will indicate a fault by illuminating the appropriate status LED, as well as display the fault code and fault description on the LCD. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower™ Service Tool provide service keys and procedures based on the service codes provided. In Power is used to configure settings.

Configurable alarm input

The control accepts maximum three alarm inputs (contact closed to ground) to cause a shutdown or warning response from the control.

Emergency stop

- Annunciate whenever an emergency stop signal is received from external switch.

Engine protection

- **Low lube oil pressure warning/shutdown** - Level is pre-set to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.
- **High coolant temperature warning/shutdown** - Level is pre-set to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.
- **Low coolant temperature warning** - Indicates that engine temperature may not be high enough for 1 min. and start or proper load acceptance.
- **Sensor failure indication** - Logic is provided on the base control to detect analog sensor or interconnecting wiring failures.

General engine protection:

Low Fuel Level Warning - Indicates that engine fuel level reached the Low Fuel Level Warning Threshold (30% by default).

Charging Alternator Failure Warning - Indicates that engine charging alternator voltage reached the low/high charging alternator threshold when charging alternator enable trim is enabled.

- **Low and high battery voltage warning** - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.
- **Weak battery warning** - The control will test the battery each time the generator set is signaled to start and indicate a warning if the battery indicates

- **Fail to start shutdown** - The control will indicate a fault if the generator set fails to start by the completion of the engine crack sequence.

ALTERNATOR PROTECTION

Battleshort Mode

- When enabled and Battle short switch is active, the control will allow non-critical shutdown faults to be bypassed. If a bypass shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a fail to shutdown fault. Emergency stop critical shutdown faults are not bypassed.

Please refer to control service and operator manual for list of critical faults

High AC voltage shutdown (59)

- Output voltage on any phase exceeds pre-set values. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 1-10 seconds. Default value is 110% for 5 seconds.

Low AC voltage shutdown (27)

- Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of voltage, time delay 2-20 seconds. Default value is 90% for 5 seconds.

Under frequency shutdown (81 u)

- Generator set output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below nominal governor set point, for a 500-2000 half cycles delay. Default: 5 Hz, 1000 half cycles.

Over frequency shutdown/warning (81 o)

- Generator set is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for 100-2000 half cycles delay. Default: 5 Hz, 1000 half cycles.

Loss of sensing voltage shutdown

- Shutdown of generator set will occur on loss of voltage sensing inputs to the control.

Current Imbalance Warning Fault

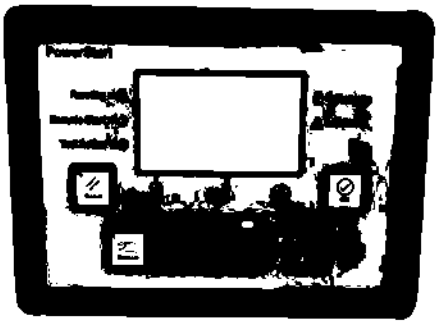
- Issues warning when current imbalance is observed per phase when genset is in running state.

High Current warning/shutdown (51)

- Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.

Auto Mains Failure Protections:

- Breaker/ATS Switch fail to close warning - when the control signals a ATS switch to close, it will monitor the ATS switch feedback contacts and verifies that switch is closed. If the control does not sense ATS switch closure within an adjustable time period of ter the close signal, the fail to close warning will be initiated.
- Breaker/ATS Switch fail to open warning - when the control signals a ATS switch to open, it will monitor the ATS switch feedback contacts and verifies that switch is opened. If the control does not sense ATS switch opened within an adjustable time period after the open signal, the fail to open warning will be initiated.



Environment

The control is designed for proper operation without recalibration in ambient temperatures from -15 °C (5 °F) to +70° C (158 °F), and for storage from -20 °C (-4 °F) to +80 °C (176 °F). Control will operate with humidity up to 95%, non-condensing.
The control board is conformal coated to provide resistance to dust and moisture. The single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments. The control is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

FIELD CONTROL INTERFACE

Input signals to the control include:

- configured to AMF specific outputs (Utility/ Genset CB Open/ Close driver) when Auto mains failure is enabled.

Communications connections include:

Control provides one RS-485 port which can be used either for PCTool interface or Modbus master interface based on protocol selection from LCD or Inpower™.

- Modbus RS485 port: Allows the control to communicate with external devices such as PLCs using Modbus protocol.
- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower™ software.
- Note — An RS-485 or USB to RS-232 converter is required for communication between control and PC.

Software

InPower (beyond 11.5.2.0 version) is a PC-based software service tool that is designed to directly communicate to Power Start generator sets and transfer switches, to facilitate service and monitoring of these products.

Certifications

PowerStart meets or exceeds the requirements of the following codes and standards:

- Remote start
- Emergency stop
- Configurable customer inputs:

Control includes (1 Control includes 3 input signals which can be configured for diagnostic inputs. Out of which 1st input can also be configured as Battle short input. 2nd and 3rd inputs gets configured to Utility CB status and Genset CB status when Auto mains failure is enabled.)

Output signals from the control include:
Control includes 6 configurable outputs which can be configured to Diagnostic Output, Glow Plug, Ready to load, L series governor.
Configurable output 3, Configurable output 4, Configurable output 5 and Configurable output 6 get

- CE marking: The control is suitable for use on generator sets to be CE-marked. EN 50081-1,2 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- PowerStart control and generator sets are designed and manufactured in ISO 9001 certified facilities.

Warranty

All components and subsystems are covered by an express limited one year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available.

Ratings definitions

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time Running Power (LTP):

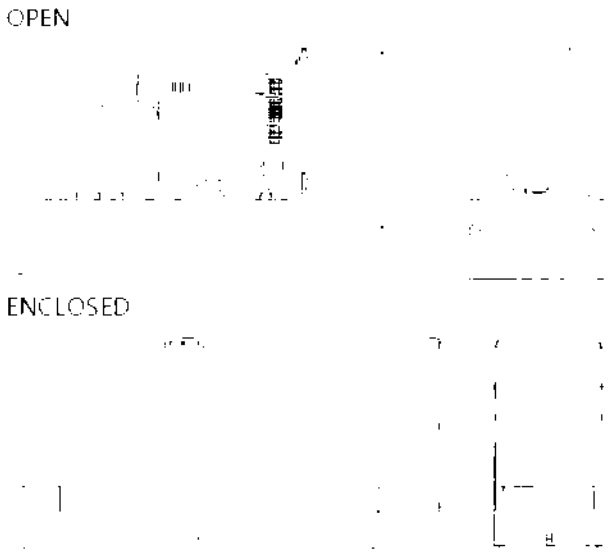
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime Power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is to provide representative configuration details for Model series only.

See respective model data sheet for specific model outline drawing number.

Do not use for installation design

	Open					Enclosed				
Model	**Length "A" mm**	**Width "B" mm**	**Height "C" mm**	**Dry wt.* kg**	**Wet wt.* kg**	**Length "A" mm**	**Width "B" mm**	**Height "C" mm**	**Dry wt.* kg**	**Wet wt.* kg**
C17 D5	1667	930	1282	628.5	644.5	2082	987	1524	942.5	964.5
C22 D5	1667	930	1282	650.5	672.5	2082	987	1524	970.5	992.5
C28 D5	1667	930	1282	694.3	716.3	2082	987	1524	1014.3	1036.3
C12 D6	1667	930	1282	601.5	623.5	2082	987	1524	921.5	943.5
C16 D6	1667	930	1282	633.5	655.5	2082	987	1524	953.5	975.5
C20 D6	1667	930	1282	633.5	655.5	2082	987	1524	953.5	975.5

* Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and standards

ISO 9001	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.	CE	The 50 Hz generator sets are available with CE certification.

JAPAN TIME: Nov / 26 / 2019 07:17 AM (JST)

Hi Your Name

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Vehicle: Note this is the same quote as used to compare the rental car option to the purchase option

tradecarview™

Japan's largest online used car marketplace.

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Japan Used Car > Japanese used car > Toyota > Land Cruiser Prado > 2018 > Toyota Land Cruiser Prado 2018

Specific Information Option Seller's Information Catalog

Specific information

VIN (vehicle certification Number) /Serial No	TRJ150-0084***	Full VIN/Serial No will be shown on Proforma Invoice and Invoice
Model Code	TRJ150W	
Registration Year / Month	2018/03	

2018 Toyota Land Cruiser Prado

TX

TOYOTA LAND CRUISER PRADO TX 4WD

24,205 km | Automatic | No Accident Gasoline/Petrol 2,700cc

STOCK 1 inquiries for this car

Car Price (FOB) **US$32,216**

Estimated Total Price **US$34,098**

*The price is not fixed. Let's try to negotiate!

Selected C&F + Pre-ship inspection

Nearest port DAR ES SALAAM

Change destination

1

Contact syuei trading (

I want to negotiate the best price

I want to know the shipping schedule

I want to know about the condition of the car

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I want to receive special promotions by emails

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> Privacy Policy

Manufacture Year / Month	Confirm with the Seller
Mileage	24,200 km
Transmission	Automatic
Engine Capacity (Displacement)	2,700cc
Fuel	Gasoline/Petrol
BodyStyle1	SUV
BodyStyle2	-
Steering	Right
Exterior Color	Black
Interior Color	Black
Drive Type	4wheel drive
Door	5
Number of Seats	5
Dimension	476cm×189cm×185cm=16.64m³
Condition	Used
ID	5/2150 191124120615
Remarks (Any Problems)	-
Comment	Very clean interior Looks & runs great Low mileage
Expiry Date	Dec / 24 / 2019 (JST)

Options

Safety

Driver Airbag	**Anti-Lock Brakes**	**Passenger Airbag**	Alarm
Side Airbag			

Comfort

Power Steering	**A/C:front**	**Remote Keyless Entry**	Navigation System
A/C:rear	**Cruise Control**	**Digital Meter**	**Tilt Steering**

Sound System

CD Player	AM/FM Radio	AM/FM Stereo	DVD
CD Changer	Aftermarket Speaker	Hard Disc	Satellite Radio

Windows

Power Windows	**Rear Window Defroster**	**Tinted Glass**	**Rear Window Wiper**

Other Features

Power Door Locks	**Alloy Wheels**	**Power Mirrors**	Sunroof
Third Row Seats	Power Slide Door		

Other selling points

No Accident history	**Maintenance Records Available**		**One Owner**
New Tires	**Non-Smoker**	Fully Loaded	Performance Tires
Turbo	Upgraded Sound System	Custom Wheels	**Repainted Car**

Seat

Leather Seats	Power Seats	Child Seat	Bucket Seat

HummingbirdIRB payments are made every 6 months 1/2

Hummingbird IRB
c/o NEIRB, 197 1st Avenue, Suite 250
Needham, MA 02494 US
(855) 447-2123
ddennett@hummingbirdirb.com
http://hummingbirdirb.com

BILL TO
Melinda Rostal
EcoHealth Alliance (2)
460 West 34th Street - 17th floor
New York, NY 10001

INVOICE # 1088
DATE 12/16/2015
DUE DATE 12/31/2015
TERMS Net 15

Continuing Review (phase II-IV) Continuing Review for Sponsor: Defense Threat Reduction Agency, Investigator: William Karesh, D.V.M.	1	1,000.00	1,000.00

PAID

Thank you for your business.

PAYMENT 1,000.00
BALANCE DUE **$0.00**

HummingbirdIRB payments are made every 6 months 2/2

Hummingbird IRB
c/o NEIRB, 197 1st Avenue, Suite 250
Needham, MA 02494 US
(855) 447-2123
ddennett@hummingbirdirb.com
http://hummingbirdirb.com

BILL TO
Emily Hagan
EcoHealth Alliance
460 West 34th Street - 17th floor
New York, NY 10001

INVOICE # 1065
DATE 06/17/2016
DUE DATE 07/02/2016
TERMS Net 15

Initial Review (Phase II-IV) New Investigator (Karesh) & Site - Hummingbird IRB #2014-25/Defense Threat Reduction Agency - 2nd installment	1	1,000.00	1,000.00

PAID

Thank you for your business.

PAYMENT	1,000.00
BALANCE DUE	**$0.00**

Ethical Clearance in Tanzania

For KCMC application the following is required:

1/ Pay Slip (500$ if it is an Ordinary study / 700 $ if it is a Clinical Trial.)
2/ Cover letter
3/ Application Form - CRERC FORM 2
4/ Full Protocol
5/ Questionnaires / Informed Consent forms (in English and Swahili)
6/ Investigators CVs - CRERC FORM 13

For NIMR application the following is required: (see next page)

1/ Pay Slip (600 USD if it is an Ordinary study / 2,100 USD if it is a Clinical Trial)
2/ Cover letter
3/ NIMR Application Form
4/ KCMC EC - Approval Certificate. (Approval from international collaborating institution if applicable)
4/ Full Protocol
5/ Investigators CVs - CRERC FORM 13
6/ Letter from RMO
7/ Material Transfer Agreement (if samples will be transferred)
8/ Data Transfer Agreement (if data will be transferred)
9/ Informed Consent forms (in English and Swahili)
10/ Questionnaires (in English and Swahili)

Please make sure to use the following format while preparing the submission to KCMC and NIMR:

1. Abstract
2. Introduction
3. Literature review
4. Problem statement
5. Rationale of the study
6. Broad Objective and specific objectives should clearly be stipulated
7. Methodology which should include 1. Study design, study area, study population, inclusion and exclusion criteria, sample size and sample size techniques, data collection methods and tools, study variables
8. Ethical considerations and limitation of the study
9. Dissemination of the results
10. The budget **(and Budget justification)** should have 10% - 25% overhead costs

National Health Ethics Review Committee (NatHREC)
Payment Rates as from October 2013

	TANZANIAN TSHS	**INTERNATIONAL US$**	**TANZANIAN TSHS**	**INTERNATIONAL US$**
Registration Fee	100,000.00	100	100,000.00	100
Clearance for Health Research Proposal (Ordinary)	300,000.00	500	150,000.00	250
Clearance for (Clinical Trial)	2,000,000.00	2,000	1,000,000.00	750
Renewal of Ethical Approval (Ordinary)	100,000.00	100	100,000.00	100
Renewal of (Clinical Trial)	200,000.00	200	200,000.00	200
Expedited Review (Ordinary)	600,000.00	1,000	-	-
Expedited Review (Clinical Trial)	3,000,000.00	4,000	-	-
Amendment (Ordinary)	200,000.00	300	100,000.00	150
Amendment (Clinical Trial)	500,000.00	500	250,000.00	250

- Always indicate the name of Principal Investigators and please attach the Deport Slip to your proposal on submission to the Secretariat National Ethics Review Committee

LOGICAL PRESENTATION OF REQUIREMENTS FOR APPLICATION OF RESEARCH CLEARANCE AND PERMIT AT COSTECH

The objective of the analysis that led to this presentation was to find a much more easier to understand presentation of the requirements to the prospective applicants.

GENERAL REQUIREMENTS: These apply to all applications

	Item	**Foreigners Affiliated to Local Research and Higher Learning Institutions**	**Others (Tanzanian, Non Tanzanians, affiliated in a foreign country, affiliated locally, etc)**
1	Detailed curriculum vitae	Required for all involved researchers	Required for all involved researchers
2	Full research proposal	Required	Required
3	Sponsor cover letter	Required	Required
4	Support letter from local collaborating institution / contact person	Required	Required
5	Recommendation letter for endorsement of the proposed research within the institution	Required	Not applicable
6	Front-page of passport	Required	Required
7	Proof of payment non-refundable application fees	50 USD	50 USD
8	Application form	Required	Required

REQUIREMENTS FOR SPECIFIC SCENARIOS

a) Research related to medical, public health, drugs, clinical trials, and wildlife issues require special clearance from relevant authorities i.e National Institute of Medical Research (NIMR) for the study that involves medical, public health and / or human subject (health); Tanzania Food and Drug Authority for Clinical Trials; and Tanzania Wildlife Research Institute (TAWIRI) for the study that involves wildlife and natural resources conservation.

b) In case of joining a new researcher to an on-going research which has already been granted a research permit, a Principal Investigator shall submit a request of research permit for a new member to COSTECH at least 2 months prior to his/her joining the research team with detailed curriculum vitae, clear justification and roles for an additional staff / researcher to the on-going project.

c) It is anticipated that the PI will remain responsible for the entire lifetime of the project, unless circumstances necessitate a change of PI. In such rare situation the head of hosting research institution shall write to notify COSTECH within 6 months since termination of outgoing PI. This will be done in writing explaining the reason for the changes and suitability of a newly identified PI. The letter requesting for amendment, accompanied by an up to date progress report shall be subjected to approval process before continuing with the research. It is the responsibility of the hosting institution to submit the request for change of PI within specified time.

POST CLEARANCE

a) After the research has been cleared, the PI will be notified by email. All FOREIGNERS who then wishes to undertake research activities in the country under the cleared research project will be required to apply for permit by presenting a proof of payment of research permit fees (300 USD) and three passport size photos.

b) All researchers granted research permit that involve collecting human, plant or animal materials / data that will be exported outside Tanzania must submit a signed Material Transfer Agreement (MTA) / Data Transfer Agreement (DTA) between Tanzania host institution and the foreign counterpart. The MTA/DTA will indicate terms for collecting, storing/managing, transporting, disposal or returning of the materials/DATA to Tanzania after the closure of the research project.

c) An Applicant who has been permitted to conduct research in Tanzania is obliged to submit soft and **two (2) hard copies** (printed) and soft copy of his/her research report /thesis with COSTECH on completion of research.

d) COSTECH will have an access to data and research premises of the permitted research projects.

e) A Principal Investigator (PI) permitted to conduct research in Tanzania is obliged to submit a quarterly/annually report.

f) Persons who have not submitted satisfactory final reports / thesis on previous research work in Tanzania may not be cleared for new projects. Attention will be drawn to the sponsoring institutions and referees on shared responsibility of making sure that researchers sponsored by them observe the foregoing regulations. A breach of the regulations could result in refusal of permits for other researchers sponsored by same institutions or referees.

g) Any patent or intellectual property and royalty emanating from any research approved by the National Research Registration Committee (NRRC) should be owned by the respective research institutions involved.

7218296

The United Republic of Tanzania

MINISTRY OF NATURAL RESOURCES AND TOURISM

Tanzania Wildlife Research Institute (TAWIRI)

Government Bill

Control Number	994330001101
Service Provider Code	SP433
Payer Name	[illegible]
Address	GLASGOW
Payer Phone	[illegible]

General Description

Research Fee for Felix Lankester to undertake his research Project: Ecosystem Health in Tanzania

Description	Quantity	Unit Price	Amount
Research Fees Non-TZ	1	[illegible]	[illegible]
[illegible] Non-TZ	1	[illegible]	[illegible]

Total: 3,800.00 USD

Amount in Words: Three Thousand Eight Hundred

Issued On	[illegible]
Expires On	[illegible]
Prepared By	[illegible]
Printed By	[illegible]
Signature	

Jinsi ya Kulipa

[illegible] [redacted]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible] [redacted] [illegible]

How to Pay

[illegible] [redacted]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible] [redacted] [illegible]

Supplies for Y3 Workshops

Cart

Account (b)(6) EcoHealth Alliance

Item	Price	Qty	Subtotal
Eppendorf Tubes™ 5.0mL with Screw Cap Catalog number 13-864-407 **by Eppendorf™** **0030122321** **Temperature Range (Metric): -86°C to 100°C, Color: Clear, Clean Claims: Pyrogen-, Dn...**	**$93.00 / Each**	3	**$279.00**
	On Order (3) - Estimated delivery 12/23/2019		
Pierce™ 96-Well Microplates Catalog number PI15042 **by Thermo Scientific™** **15042** **Description: Pierce 96-Well Polystyrene Plates, White Opaque**	**$138.40 / Pack of 25**	2	**$276.80**
	Ships from manufacturer - Usually Ships in 1 Business Days		
ART™ Barrier Specialty Pipette Tips Catalog number 21-402-185 **by Thermo Scientific™** **2770** **Tip Style: Ergonomic, Volume (Metric): 200µL, Compatibility: Thermo Scientific™ Finnp...**	- **$191.70 / Pack of 960** **$846.00 / Case of 5 PK**	1	**$191.70**
	In Stock (1) - Estimated delivery 11/29/2019		

Order Summary

Subtotal	$1,413.60
▲ Shipping and Handling *	$105.59
Shipping fuel surcharge	$4.45
Shipping charge	$101.14
Estimated Tax	$0.00

*Extra charges may apply for products that require special services.

*Additional handling charges determined by direct ship manufacturers may apply.

Generate a Web Quc

View All Quotes | What's this?| missing translation for 'faq'

Item	Price	Qty	Subtotal
ART™ Barrier Specialty Pipette Tips Catalog number 21-236-85 **by Thermo Scientific™** **2279** **Tip Style: Ergonomic, Volume (Metric): 1000µL, Compatibility: Thermo Scientific™ Finn...**	**$227.00 / Pack of 800** **$839.00 / Case of 4 PK**	1	**$227.00**
	In Stock (1) - Estimated delivery 11/29/2019		
ART™ Non-Filtered Standard Hinged Rack Pipette Tips Catalog number 13-811-159 **by Thermo Scientific™** **310105HR** **Volume (Metric): 1000µL, Description: ART Non-filtered Low Retention, Sterility...**	**$129.10 / Pack of 768** **$471.00 / Case of 4 PK**	1	**$129.10**
	On Order (1) - Estimated delivery 12/05/2019		
Fisherbrand™ Sure One™ Low Retention Non-Filtered Pipette Tips, 200 µL, Standard Length Catalog number 02-707-019 **Packaging: Hinged Rack, Sterility: Sterile**	**$79.00 / Pack of 960** **$356.00 / Case of 5 PK**	2	**$158.00**
	On Order (2) - Estimated delivery 01/03/2020		

Item	Price	Qty	Subtotal
Fisherbrand™ Sure One™ Low Retention Non-Filtered Pipette Tips, 10 µL, Micro Length Catalog number 02-707-011 **Packaging: Hinged Rack, Sterility: Sterile**	**$76.00 / Pack of 960** **$342.00 / Case of 5 PK**	2	**$152.00**

On Order (2) - Estimated delivery 01/03/2020

Add all items to a list

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Criteria for Publication

1. The study presents the results of original research.
2. Results reported have not been published elsewhere.
3. Experiments, statistics, and other analyses are performed to a high technical standard and are described in sufficient detail.
4. Conclusions are presented in an appropriate fashion and are supported by the data.
5. The article is presented in an intelligible fashion and is written in standard English.
6. The research meets all applicable standards for the ethics of experimentation and research integrity.
7. The article adheres to appropriate reporting guidelines and community standards for data availability.

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Software Fees

Quotation

2823 Carlisle Ave.
Racine, WI 53404
p. (800) 342-4222
f. (800) 440-5036

Quote #	115815
Terms	NET 30
Contact	Megan Walsh walsh@ecohealthalliance.org (212) 380-4462
Quote Date	8/19/2019
Expires	8/26/2019

Sales Rep: Tom Haven
tom.haven@ccbtechnology.com
p. (800) 342-4222

EcoHealth Alliance
Megan Walsh
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Accounts Payable
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Megan Walsh
460 W 34th St Fl 17
New York, NY 10001-2317
UNITED STATES
(212) 380-4460
walsh@ecohealthalliance.org

Adobe subscription renewal			Electronic Delivery

25	Adobe Acrobat Pro DC for Teams 12 month subscription renewal	$177.00	$4,425.00	2019-09-18	2020-09-17	
15	Adobe Creative Cloud for Teams 12 month subscription renewal	$370.00	$5,550.00	2019-09-18	2020-09-17	

Sub Total:	$9,975.00
Shipping and Handling:	$0.00
Tax Rate: (0.08875)	$0.00
Total	**$9,975.00**

Please note:

Return policies vary per manufacturer. (Apple and McAfee both have a no returns policy)

Custom configured items/built-to-order items are non-returnable.

Start dates and end dates for renewals may change based on the manufacturer's guidelines, policies, renewal order date, or date of activation.

Price is subject to change based on potential fluctuation of trade tariff regulation.

Dropbox Inc.
333 Brannan Street
San Francisco, CA 94107
United States
billing-support@dropbox.com

Invoice for EcoHealth Alliance

TO	DATE	INVOICE ID
Megan Walsh walsh@ecohealthalliance.org 10001 United States	February 25, 2019 6:50 AM GMT	SLSWTLNSKN5J

PRODUCT	PRICE	DISCOUNT	AMOUNT
Dropbox Business Advanced Plan (includes 3 licenses) + 60 Additional Licenses + Unlimited API Call Rate Limit + Unlimited Extended Version History (2/25/2019 to 2/25/2020)			
Dropbox Business Advanced Plan (includes 3 licenses)	$600.00	30%	$420.00
60 Additional Licenses	$12,000.00	30%	$8,400.00
Unlimited API Call Rate Limit	$0.00	30%	$0.00
Unlimited Extended Version History	$0.00	30%	$0.00
Total			$8,820.00

All amounts shown are in USD.

Clarivate
Analytics

Clarivate Analytics
Philadelphia, PA 19130
1500 Spring Garden Street, Suite 400
Philadelphia, PA 19130

To: Megan Walsh, Department Head, EcoHealth Alliance

Re: Your EndNote X9 Upgrade License Quote

Sent by e-mail: 10/16/2018

Thank you for your interest in our products. Please accept this letter (via e-mail) as our quote for Endnote X9.

License Type	Total Users	Total Price (excludes state tax, if applicable)
Endnote X9 Upgrade License (US$99.95 each)	40	US$3,998.00

Promotional Pricing Valid 11/16/2018

Purchasing Instructions:
If applicable, send Bill Durant your institution's Tax-Exempt Certificate for your state's tax to be excluded from your order

Contact Bill at 215-823-1797 or william.durant@clarivate.com to receive EndNote.

Premium access to EndNote Web – **Free**
Training and support - $0.00 – **Free**
Shipping – Digital Download - $0.00 – **Free**

You may place your order on a purchase order (terms are Net 30), by check/money order drawn on a U.S. bank or Visa/MasterCard/American Express.

Regards,

Bill Durant
Account Manager
(215) 823-1797
William.Durant@clarivate.com

2823 Carlisle Ave.
Racine, WI 53404
p. (800) 342-4222
f. (800) 440-5036

Invoice IN88282-1

Order #	88282
Terms	NET 30
Contact	Megan Walsh walsh@ecohealthalliance.org (212) 380-4462
Invoice Date	4/11/2018
Due Date	5/11/2018

Sales Rep: Tom Haven
tom.haven@ccbtechnology.com
p. (800) 342-4222

EcoHealth Alliance
Megan Walsh
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
(212) 380-4462
walsh@ecohealthalliance.org

EcoHealth Alliance
Accounts Payable
460 W 34th St FL 17
New York, NY 10001
UNITED STATES
walsh@ecohealthalliance.org
(212) 380-4462

CCB Technology
Accounts Receivable
2823 Carlisle Ave.
Racine, WI 53404
(800) 342-4222

(10) Office 2016 Standard Edition licenses	Per Phone	

1	Microsoft Corporation	021-10552	10	Microsoft Office 2016 Standard Edition license	$94.00	$940.00

Sub Total:	$940.00
Shipping and Handling:	$0.00
Tax Rate: (0.00000)	$0.00
Total	**$940.00**
Credits/Payments:	$0.00
Total Due:	**$940.00**

Shipping Location

1	EcoHealth Alliance Megan Walsh 460 W 34th St Fl 17 New York, NY 10001-2317 UNITED STATES (212) 380-4460 walsh@ecohealthalliance.org	10	$940.00

Shipping Detail

4/10/2018	Microsoft Corporation	021-10552	

Tracking Numbers

4/10/2018	Other	*VIRTUAL (Unrecognized Number)*

Please note:

Return policies vary per manufacturer. (Apple and McAfee both have a no returns policy)

Custom configured items/built-to-order items are non-returnable.

Start dates and end dates for renewals may change based on the manufacturer's guidelines, policies, renewal order date, or date of activation.

Fringe Benefits Allocation Policy

Compensated absences, including vacations, sick, holidays and personal days are considered salaries and wages and, as such, are recorded as salaries and wages when used.

No separate claims are made for those costs under fringe benefits costs category. Compensated absences earned, but not used, are not carried over to the next fiscal year. There is a grace period of using the earned compensated absences by September 30.

All employees are covered for Social Security, NYC commuter taxes, payroll transit taxes, Worker's compensation insurance and unemployment.

Employees working 35 hours or more per week are eligible:

- Health Insurance, including medical, dental and vision;
- Life Insurance;
- 403(B) pension plan (After nine (9) months of employment);
- Short and long term disability.

Employees working more than 20 hours but less than 35 hours per week are eligible for the following fringe benefits:

- Life Insurance;
- Short-Term/long-Term Disability;
- 403(B) pension plan (After nine (9) months of employment).

Fringe Benefits are tracked by employees and charged directly or indirectly in the same manner as employees' salaries and wages.

Although, the costs principles policy for fringe benefits has not changed, effective fiscal year 2020 starting July 1, 2019, EcoHealth Alliance no longer negotiates a fringe benefits rate with the Department of Defense.

For funding proposals, fiscal year 2019 actual data will be used to budget fringe benefit costs. For billing, invoicing and reporting purposes to federal and non-federal donors the actual benefits will be allocated and requested.

ECOHEALTH ALLIANCE, INC.
YEAR ENDED JUNE 30, 2019

Schedule of Fringe Benefits

Categories		Amount	
Salaries and Wages	**$**	**4,426,650**	**A**
Fringe Benefits			
Health Insurance		782,523	
Health Insurance payments in lieu of benefit		11,898	
Vision Care		2,509	
Washington DC Family Leave Ins		218	
Washington Unemployment Insurance		133	
Life Insurance ST/LT Disability/Dental		121,563	
NYS Unemployment Ins (NYSUI)		9,483	
NYS Disability Insurance		2,276	
Pension Expense		305,704	
Tuition Reimbursement expense		12,834	
NYS Commuter Tax		14,145	
Payroll Transit Tax - Federal		12,734	
Payroll Transit Tax New York		5,457	
FSA Fees		32,723	
Social Security Employor Expense		295,392	
Washington DC Unemployment Tax		243	
Workers Compensation		19,173	
Total	**$**	**1,629,007**	**B**
Frindge Benefits Rate	**%**	**36.80**	**B/A**

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
875 NORTH RANDOLPH STREET
SUITE 1425
ARLINGTON, VA 22203-1995

Agreement Date: July 17, 2019

NEGOTIATION AGREEMENT

INSTITUTION: **ECOHEALTH ALLIANCE, INC.**
460 WEST 34TH ST. 17TH FLR
NEW YORK, NY 10001-2320

The Indirect Cost rate contained herein is for use on grants, contracts and/or other agreements issued or awarded to the EcoHealth Alliance, Inc. by all Federal Agencies of the United States of America, in accordance with the provisions and cost principles mandated by 2 CFR Part 200. The rate shall be used for forward pricing and billing purposes for the EcoHealth Alliance, Inc. Fiscal Year 2020. This rate agreement supersedes all previous rate agreements/determinations for Fiscal Year 2020.

Section I: RATES - TYPE: PROVISIONAL (PROV)

Indirect Rates:

TYPE	FROM	TO	RATE	BASE	APPLICABLE TO	LOCATION
Prov.	07/01/19	06/30/20	32.0%	(a)	All	All

DISTRIBUTION BASES

(a) Total direct costs excluding capital expenditures (buildings, individual items of equipment; alterations and renovations), the portion of each subaward in excess of $25,000, participant support costs, and flow-through funds.

SECTION II - GENERAL TERMS AND CONDITIONS

A. **LIMITATIONS:** Use of the rate set forth under Section I is subject to availability of funds and to any other statutory or administrative limitations. The rate is applicable to a given grant or contract or other agreement only to the extent that funds are available. Acceptance of the rate agreed to herein is predicated upon the following conditions: (1) that no costs other than those incurred by the organization were included in this indirect cost pool as finally accepted and that such costs are legal obligations of the organization and allowable under governing cost principles; (2) that the same costs that have been treated as indirect costs are not claimed as direct costs; (3) that similar types of costs have been accorded consistent accounting treatment; and (4) that the information provided by the organization which was used as a basis for acceptance of the rate agreed to herein, and expressly relied upon by the Government in negotiating and accepting the said rate is not subsequently found to be materially incomplete or inaccurate.

B. **ACCOUNTING CHANGES**: The rate contained in Section I of this agreement is based on the accounting system in effect at the time the agreement was negotiated. Changes to the method(s) of accounting for costs, which affect the amount of reimbursement resulting from the use of the rate require the prior written approval of the authorized representative of the cognizant agency for indirect costs. Such changes include but are not limited to changes in the charging of a particular type of cost from indirect to direct. Failure to obtain such approval may result in subsequent cost disallowances.

C. **PROVISIONAL RATES:** The provisional rate contained in this agreement is subject to unilateral amendment by the Government or bilateral amendment by the contracting parties at any time.

D. **USE BY OTHER FEDERAL AGENCIES**: The rate set forth in Section I is negotiated in accordance with and under the authority set forth in 2 CFR Part 200. Accordingly, such rate shall be applied to the extent provided in such regulations to grants, contracts, and other agreements to which 2 CFR Part 200 applies, subject to any limitations in part A of this section. Copies of this document may be provided by either party to other federal agencies to provide such agencies with documentary notice of this agreement and its terms and conditions.

E. **SPECIAL REMARKS**: The Government's agreement with the rate set forth in Section I is not an acceptance of the EcoHealth Alliance, Inc.'s accounting practices or methodologies. Any reliance by the Government on cost data or methodologies submitted by EcoHealth Alliance, Inc. is on a non-precedence-setting basis and does not imply Government acceptance.

Accepted:

FOR ECOHEALTH ALLIANCE, INC.:	FOR THE U.S. GOVERNMENT:
ARMINE ARUSTAMYAN	LINDA MORGAN WOOD
Chief Financial Officer	Contracting Officer
07-17-19	7/17/19
Date	Date

For information concerning this agreement contact:

Sharon Gales
Office of Naval Research
875 North Randolph Street
Arlington, VA 22203-1995

Phone: (703) 696-8559
E-mail: sharon.gales@navy.mil

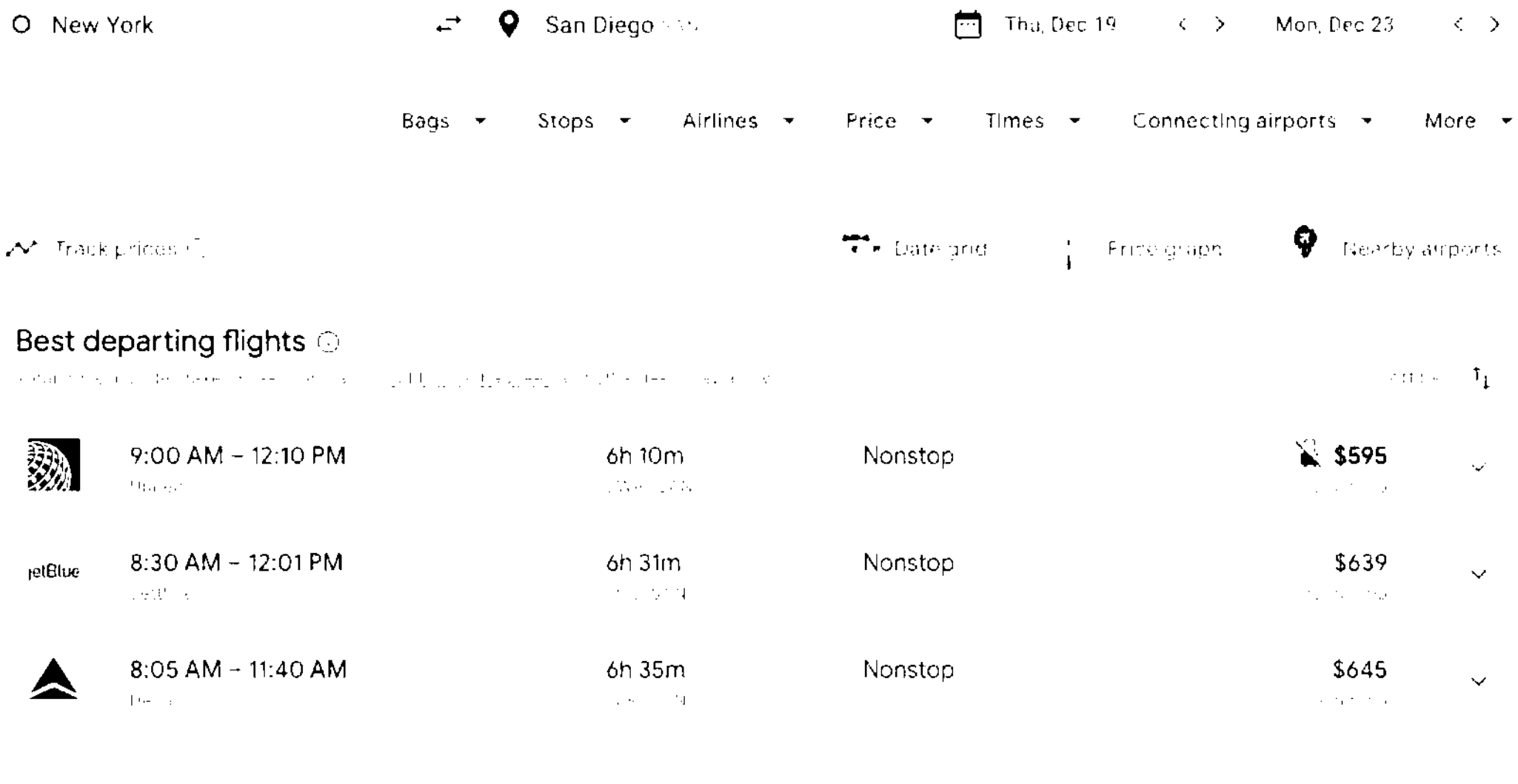
APHA 2019 REGISTRATION FEES

Meals are not included in registration fees

Full Conference Registration Member perks! Members save up to $100 more on registration!	Early-Bird Aug. 8	Advance Sept. 12	Final After Sept. 12	Membership Dues
Regular Member	**$546**	$606	$665	**$225**
Company/Consultant Individual[~]	$546	$606	$665	$145
Agency Individual[+]	$546	$606	$665	$70
Discounted Regular (salary < $45,000)	$337	$372	$407	$110
Retired	$337	$372	$407	$100
Student[*]	$247	$282	$292	$85
Early-Career Professional[**]	$345	$390	$435	$135
Non-Member	$871	$931	$990	
Non-Member Student	$382	$417	$427	
Guest (Non-Public Health)[***]	$345	$380	$415	

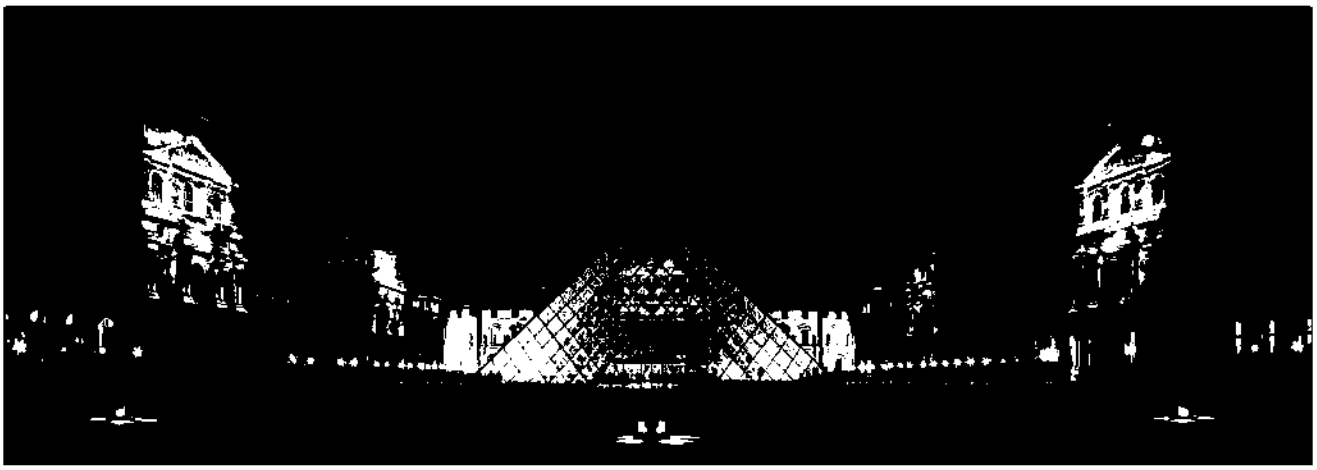
Example of cost of registration for domestic conference APHA it is either $546 + $225 or $871 - we used the former for our budget.

Example of cost of flight costs for domestic conference APHA.



ICEID 2020: 14. International Conference on Epidemiology and Infectious Diseases

July 20-21, 2020 in Paris, France



Conference Code: **20FR07ICEID**

Submit Your Paper | Author Registration | Listener Registration

About | Call For Papers | Important Dates | Committees | Registration Fees | Conference Photos | Flyer | Program

Participation Type	Early Registration Fees	Registration Fees
Non-Student Oral/Poster Presenter Registration	€ 450	~~€ 500~~
Student Oral/Poster Presenter Registration	€ 350	~~€ 400~~
Listener Registration	€ 250	~~€ 300~~
Additional Paper Publication	€ 100	

All conference materials and services will be delivered digitally to the participant with the online conference management system. Conference registration includes the following digital materials and services:

- e-certificates [for Authors: Certificate of Attendance and Presentation; for Listeners: Certificate of Attendance; for Chairs: Certificate of Attendance and Appreciation; for Presenters: Certificate of Best Presentation (if conferred based appraisal)]
- e-program
- e-book
- e-name badge
- e-receipt
- e-presentation

Presentation Types:

- **Physical presentation** is an oral conferencing presentation that is made using digital technology including embedded digital elements (texts, tables, graphs, or videos) for PowerPoint sharing.
- **Digital presentation** is a digital conferencing presentation that is made using digital technology including embedded digital elements (texts, tables, graphs, or videos) for PowerPoint sharing.

Early Bird Registration

Early Bird registration is valid until **2020-06-19 23:59:59**

Online Credit Card Processing

Online payment option available for author and listener delegates.
Conference participants can make online credit card payments for conference registration fees.

New York

Paris

Sat, Jan 4

Thu, Jan 9

Bags

Nonstop

Airlines

Travel Jan 6 - 10 for $540

irports

More

Best departing flights

	6:25 PM – 7:25 AM[+1]	7h 0m	Nonstop	$1,280
	5:29 PM – 6:35 AM[+1]	7h 6m	Nonstop	
	10:30 PM – 11:20 AM[+1]	6h 50m	Nonstop	$1,460
	5:50 PM – 7:20 AM[+1]	7h 30m	Nonstop	$1,480
AF	11:55 PM – 1:05 PM[+1]	7h 10m	Nonstop	$1,480

73

Invoice for legal services associated with an O-1 Visa

VISASERVE
Nachman, Phulwani, Zimovcak
Law Group, P.C.
Immigration and Nationality Law

Nachman Phulwani & Zimovcak
(NPZ) Law Group, P.C
487 Goffle Road
RIDGEWOOD, NJ 07450
(201) 670-0006x109
christoph_jenke@visaserve.com
http://www.visaserve.com

BILL TO
EcoHealth Alliance
460 West 34th Street
17th Floor
New York, NY 10001-2320

INVOICE #
DATE 12/29/2016
DUE DATE 01/28/2017
TERMS Net 30

ATTORNEY	PARALEGAL		
O-1 Visa by EcoHealth Alliance for [redacted] - Paid		4,500.00	4,500.00
FEDEX International Shipping Charge 12/15/2016		142.26	142.26

For your convenience you can pay online at:
https://secure.lawpay.com/pages/npzlawgroup/operating

PAYMENT	4,500.00
BALANCE DUE	**$142.26**

Solo

Hotel in NYC while looking for appartment

Rates		Price per night
○ YOTEL member		
Pay later	Rate summary	$129.44
● Book now and save 30%		
Pay now	Rate summary	$133.44

Guests: 1 — Add

○ Flexible		
Pay later	Rate summary	$190.62

Premium Queen

Rates	Price per night

YOUR RESERVATION

Edit your booking

Price Check

Location:	YOTEL New York
Nights:	8
From:	Aug 01 2020
To:	Aug 09 2020
Room 1	Solo
Remove	1 x Guests
	Book now and save 30% $1067.50

Total cabin cost	$1067.50
Javits tax	$157.45
NYC sales and occupancy tax	$157.45
City and state tax	$157.45
Facility fee	$280.00
Total taxes and fees	$752.35
Total (including taxes and fees)	$1574.23

We can only hold you selected cabin(s) for twenty minutes in the online booking process, after that we will have to let them go.

Confirm Booking

Log In Sign Up Locations Tanzania - English My Profile

Search

Quick Start Tracking Shipping Services Customer Service

UPS Home > Shipping > Calculate Time & Cost

Parcel Delivery Quote

Log in and select a UPS account to receive the most accurate rate and delivery time information. Log In

Package | Freight

Print Find Locations

Please provide information about your shipment including destination, origin, shipment date, and weight. Required fields are indicated with * .

1 Where and When?

Ship To:
NEW YORK, 10001 United States
Residential

Ship From:
DAR ES SALAAM ILALA, 12101
Tanzania
Commercial

Shipment Date:
Friday 1 November 2019

Customs Value:
100 USD

Duty Type:
09 - Low value

2 Enter Detail to Show Cost

Packaging:
My Packaging
40 x 20 x 40 cm

Package Weight:
15 kg

Number of Packages:
1

Declared Value:
500 USD

Additional Resources / Tools
- Zones and Rates

Showing Results For:
DAR ES SALAAM ILALA, 12101, Tanzania to New york, 10001, United States

Service	Time	Cost (All Packages)
UPS Express Plus **Latest Pickup Time:** 4:00 P.M. Friday 1 November 2019 **Schedule by :** 3:00 P.M.	**Delivered By:** 8:30 A.M. Tuesday 5 November 2019	513.71 USD Billable Weight: 15.0 kg View Details Ship Now
UPS Express **Latest Pickup Time:** 4:00 P.M. Friday 1 November 2019 **Schedule by :** 3:00 P.M.	**Delivered By:** 10:30 A.M. Tuesday 5 November 2019	409.65 USD Billable Weight: 15.0 kg View Details Ship Now
UPS Express Saver **Latest Pickup Time:** 4:00 P.M. Friday 1 November 2019 **Schedule by :** 3:00 P.M.	**Delivered By:** By End of Day Tuesday 5 November 2019	389.65 USD Billable Weight: 15.0 kg View Details Ship Now

Rate estimates are based on export rates from the origin (Ship From) country or territory.

Result estimates calculated by UPS: Friday 1 November 2019 1:15 P.M. Eastern Time (USA)

* Rate includes a fuel surcharge . For a breakdown of charges, select View Details beside each service.

Shipping costs for the move to NYC

- **Standard-sized 1st bag is free and 2nd bag fee applies when returning back to Cuba**

Charges

Region	Bag 1	Bag 2	Bag 3	Bag 4+
Domestic	$30	$40	$150	$200
Mexico	$30	$40	$150	$200
Haiti	$0	$40**/70**	$150	$200
Caribbean	$30*	$40/$70**	$150	$200
Panama	$0	$40	$150	$200
Central America (except Panama)	$30*	$40/$55**	$150	$200
Brazil	$0	$0	$150	$150
Colombia	$0/$30*	$55	$150	$200
Ecuador	$0	$40	$150	$200
Guyana	$30	$40	$150	$200
Venezuela	$0	$55	$150	$200
South America (except Brazil, Colombia, Ecuador, Guyana, and Venezuela)	$0	$0	$150	$200
Transatlantic	$0/$60^	$100	$200	$200
Transpacific	$0	$0	$200	$200

All published bag fees are base rates according to travel dates and destination; applicable taxes are not shown. Seasonal pricing applies for tickets issued on / before April 17, 2019 for travel on December 8 - 24, 2019 or for tickets issued on / after April 18, 2019 for travel on December 7, 2019 - January 12, 2020. Seasonal pricing also applies for tickets issued on / before August 19, 2019 for travel on June 15, 2020 - August 12, 2020 or for tickets issued on / after August 20, 2019 for travel on June 1, 2020 - August 19, 2020.

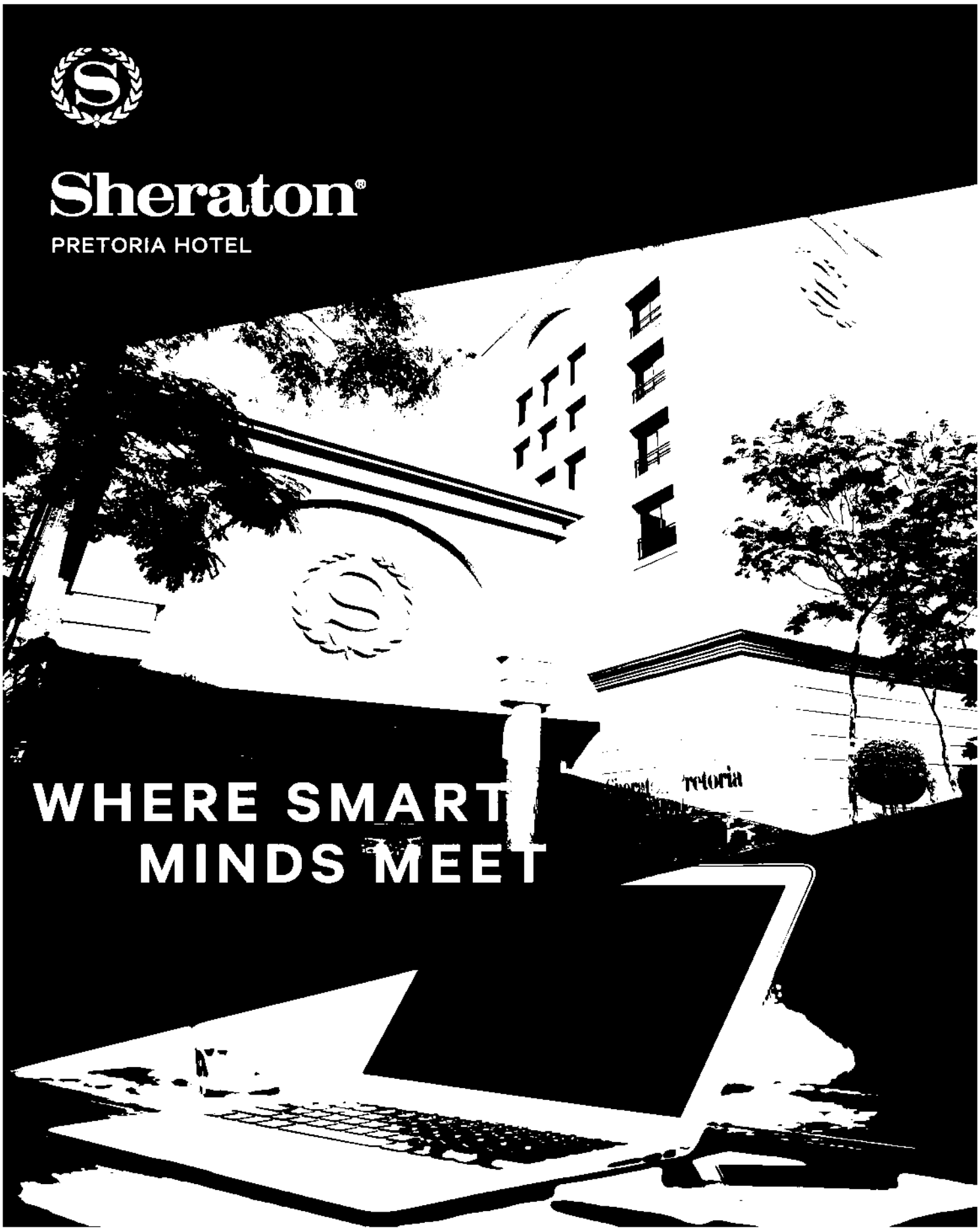
*For travel to / from El Salvador, the 1st bag fee of $30 applies seasonally. For travel to / from Cali, Colombia the 1st bag fee applies seasonally for tickets issued on or before April 2, 2019. There is no 1st bag fee to / from Cali, Colombia for tickets issued on or after April 3, 2019.

**For travel to / from Honduras, a $55 2nd bag fee applies seasonally. For travel to / from Port au Prince, Haiti a $55 2nd bag fee applies seasonally for tickets issued on / before November 12, 2018 (no seasonal increase for Cap Haitien) and a year-round 2nd bag fee of $70 applies for tickets issued on / after November 13, 2018 and for travel beginning January 14, 2019 for Port au Prince and Cap Haitien.

^$60 1st bag fee applies to Transatlantic Basic Economy tickets

Optional service fees »

Example of quote from stakeholders' meeting in Pretoria South Africa



T: +27 12 429 9999
E: groups@sheratonpretoria.com

Sheraton
PRETORIA HOTEL

Quotation

Attention:	Melinda Rostal DVM, MPH
Company:	EcoHealth Alliance
Telephone:	1.212.380.4489
Email:	rostal@ecohealthalliance.org
Quotation date:	07 October 2019

Quotation in respect of: EcoHealth Alliance

Dear Melinda,

Thank you for the opportunity and for considering the Sheraton Pretoria as a destination for your event.

I'm excited to share with you our proposal.

Attached a detailed quotation to ensure we deliver on all your goals and ideas. I'm looking forward to be working with you and should you require any additional information, please contact me directly.

Please note that no venue or rooms have been blocked off on your behalf and this quote is only valid for 48 hours.

Have an excellent day and I'm looking forward to your response.

Best regards,

Paseka Matjila
Sales and Marketing Coordinator
+27 12 429 9999

T: +27 12 429 9999
E: groups@sheratonpretoria.com

Sheraton
PRETORIA HOTEL

Quotation

DATE	DAYS	PAX	DESCRIPTION	AMOUNT	DEBIT
			ACCOMODATION REQUIREMENTS		
16-21 NOV 2019	5	1	Classic King Room / Single occupancy	R1 050.00	R5 250.00
18-22 NOV 2019	4	3	Classic King Room / Single occupancy	R1 050.00	R12 600.00
19-20 NOV 2019	1	2	Classic King Room / Single occupancy (Including Breakfast)	R1 350.00	R2 700.00
19-21 NOV 2019	2	1	Classic King Room / Double occupancy (Including Breakfast)	R1 750.00	R3 500.00
19-22 NOV 2019	3	2	Classic King Room / Single occupancy (Including Breakfast)	R1 350.00	R8 100.00
20-21 NOV 2019	1	4	Classic King Room / Single occupancy (Including Breakfast)	R1 350.00	R5 400.00
20-21 NOV 2019	1	1	Classic King Room / Single occupancy	R1 050.00	R1 050.00
				TOTAL	**R38 600.00**
			EVENT REQUIREMENTS		
20-Nov-19	1	80	Full Day Conference Package(Including Lunch) **Jacaranda 1**	R430.00	R34 400.00
19-Nov-19	1	6	Buffet Dinner (Magnolia Restaurant)	R330.00	R1 980.00
	1	6	1x Softdrink	R45.00	R270.00
19-Nov-19	1	1	Venue Hire for 12 PAX **MOPANI**	R3 500.00	R3 500.00
	1	1	Screen	R500.00	R500.00
20-Nov-19	1	2	Buffet Dinner (Magnolia Restaurant)	R330.00	R660.00
	1	2	1x Softdrink	R45.00	R90.00
21-Nov-19	2	1	Buffet Dinner (Magnolia Restaurant)	R330.00	R660.00
	2	1	1x Softdrink	R45.00	R90.00
22-Nov-19	2	2	Buffet Dinner (Magnolia Restaurant)	R330.00	R1 320.00
	2	2	1x Softdrink	R45.00	R180.00
			Classroom		
				TOTAL	**R43 650.00**

NOTE: The Day Conference Package Includes the following;

Arrival Tea/Coffee/Juice/Pastries
Mid-morning Tea/Coffee/Juice/Savoury Snacks
Buffet Lunch in Magnolia - Chef's Choice (12:30 - 14:00)
1 x Refreshment included with Lunch
Afternoon Tea/Coffee/Juice/Biscuits
Water, Mints, Pens, Paper
Parking
Venue Hire included
Wi-Fi, Screen, Data Projector, Flipchart and Markers
PA System & Microphone included

Rates are inclusive of VAT

TOTAL **R82 250.00**

TERMS & CONDITIONS

The Sheraton Pretoria Hotel reserves the right to change its rates without prior notification; to review rates and conditions offered in this quotation in instances where full disclosure on the conference/group booking is not given, example being - name of conference, type of conference, number of overall delegates attending the conference, specific dates, etc.

Venues are subject to availability. The allocation of a suitable venue for the event is to the discretion of the hotel.

Should you require me to reserve a venue on your behalf, kindly forward me written confirmation as soon as possible whereupon a contract and payment details will be sent to you. Please note that we work on a live system and availability changes on a daily basis.

Please note that no venue or rooms have been blocked off on your behalf and this quote is only valid for 48 hours.

CANCELLATION POLICY

Between 60 to 31 days prior to arrival, a charge of 50% of the contracted value will be levied.
Between 30 to 15 days prior to arrival, a charge of 75% of the contracted value will be levied.
Between 14 to 0 days prior to arrival, a charge of 100% of the contracted value will be levied.
(Full Cancellation Policy will be sent with the contract)

If you have any questions please call: Conferencing · +27 12 429 9999

Internet and Communication Services

EcoHealth Alliance

December 4th, 2019

To Whom it May Concern,

We estimate that the monthly proportion of the Altice Business bill that will be charged to the CCHF grant for communication and internet access is $333.33.

Sincerely,

Megan Walsh

Human Resources and Office Manager

walsh@ecohealthalliance.org

212-380-4477

altice business

AlticeBusiness.com

ECOHEALTH ALLIANCE

Monthly Summary	Page 1 of 2
Account Number	(b)(4)
Invoice Date	11/01/19
Invoice Number	100207378
Previous Balance	$3,934.66
Current Charges	$3,931.54
Total Amount Due	**$3,931.54**

Total Amount Due December 1, 2019

Usage From: 10/01/19 - 10/31/19

To contact Altice Business, please call (866) 611-3434 or (516) 803-6000, or feel free to e-mail us at Care@AlticeUSA.com

Enhanced Caller ID!

Altice Businesses newest enhancement is now included in Altice Business Voice services at no additional cost. Not only do we help take the guesswork out of who?s calling you, but now we can help detect robocalls too.

Visit the Customer Portal

View your invoice, service inventory, pay online, see Call Detail reports and more. Simply go to portal.alticebusiness.com. New access is available through the Request Access button. In person payments can no longer be accepted.

Important Messages:

New! Call Recording is now available for Business Hosted Voice services. Contact your Account Executive for details.

New York Sales Tax Breakdown For Our Common Bundles
Internet/Voice Bundle
66% of the total charge is attributable to Internet access service and 34% is attributable to voice service. For purposes of calculating the NY sales tax, 24.5% of the voice fee is attributable to interstate/international service.

Toll Free Bundle or Audio Conference Bundle
For purposes of calculating the NY sales tax, 76% of the fee is attributable to interstate/international service.

Enterprise Voice Bundle
For purposes of calculating the NY sales tax, 24.5% of the fee is attributable to interstate/international service.

altice business

AlticeBusiness.com

ECOHEALTH ALLIANCE

Account Number (b)(4)

Usage From 10/01/19 - 10/31/19

PAYMENTS, CREDITS AND ADJUSTMENTS:

Description	Total
10/22/2019 Payment - Thank You	-3,934.66

SERVICES:

Description	From Date - To Date	Qty	Non-Recurring	Recurring	Total
Managed Router	11/01/2019 - 11/30/2019	1	$0.00	$0.00	$0.00
100Mb/50K Internet/Voice Bundle	11/01/2019 - 11/30/2019	1	$0.00	$3,549.00	$3,549.00
Primary Rate Interface - ISDN	11/01/2019 - 11/30/2019	1	$0.00	$0.00	$0.00
DID Reserve 20 Numbers - 3 yr	11/01/2019 - 11/30/2019	7	$0.00	$60.00	$60.00
TOTAL SERVICE CHARGES			**$0.00**	**$3,609.00**	**$3,609.00**

TAXES AND SURCHARGES:

Description	Total
911 Surcharge(s)	24.00
Federal Excise Tax	1.92
Local Utility Gross Receipt Tax	82.76
MTA Surcharges	27.71
State and Local Gross Receipts Taxes	112.22
Universal Service Fund Surcharge	73.93

system76

Server needs

Ibex Pro GPU

1

REMOVE FROM CART

modify configuration *REMOVE FROM CART*

Base Price	**$5,899.00**
Ubuntu Server **18.04** LTS (64-bit)	
1× 20 Cores Gold 6230 (2.1 up to 3.9 GHz - 40 Threads - Max memory speed 2933 MHz)	**$2,229.00**
1× 512 GB Quad Channel DDR4 @ 2933 MHz (8x 64GB)	**$2,699.00**
1× 20 Cores Gold 6230 (2.1 up to 3.9 GHz - 40 Threads - Max memory speed 2933 MHz)	**$2,519.00**
1× 512 GB Quad Channel DDR4 @ 2933 MHz (8x 64GB)	**$2,829.00**
1× 4,352 Cores 11GB GeForce RTX 2080 Ti with 4352 CUDA Cores	
1× 2 TB NVMe Install on PCI SSD	**$1,329.00**
1× 16 TB HDD *7200 RPM* (8x 2TB)	**$2,759.00**
10 Gb Dual Port Ethernet Network Adapter (Included)	
Limited 1 Year Labor and 3 Year Parts Warranty	
This product is custom built and non-cancellable, non-refundable.	

Product total: **$20,263.00**

84

Consumer Price Index Overview Table – New York-New Jersey

Consumer Price Index for All Urban Consumers, all items, in the U.S., Northeast, Middle Atlantic, and a metropolitan area, not seasonally adjusted
(1982-84=100 unless otherwise noted)

Area (Links provide news releases)	Back data	Annual average 2018	Sep 2019	Oct 2019	Percent change: Annual average 2017 to 2018	Percent change: 12 months ended Sep 2019	Percent change: 12 months ended Oct 2019
U.S. City Average		251.107	256.759	257.346	2.4	1.7	1.8
Northeast region(1)		265.139	270.563	270.348	2.2	1.4	1.5
Northeast City Size Class (population)							
A (greater than 2,500,000)		268.112	274.058	273.930	2.0	1.5	1.5
B/C (2,500,000 or less)		156.258	159.106	158.912	2.5	1.4	1.4
Middle Atlantic(2)		101.578	103.535	103.518		1.3	1.4
Metropolitan area							
New York-Newark-Jersey City		273.641	279.338	279.255	1.9	1.4	1.5

Footnotes
(1) The Northeast region includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
(2) The Middle Atlantic division includes New Jersey, New York, and Pennsylvania.

Source: Consumer Price Index
The Consumer Price Index (CPI) measures changes in prices of all goods and services purchased for consumption by urban households.

99 7001 (b)(4) JUSTINE A ASSENGA

99-001 02/08/2023 TGS/J/1

DESCRIPTION	BALANCE	AMOUNT
Basic Salary		3,360,000.00
PSSSF		-168,000.00
Income Tax		-809,460.00
Natl Health Ins FundEmployee		-100,800.00
NET AMOUNT DUE	31/10/2019	**2,281,740.00**

62 3001 (b)(4) JUBILATE B MINJA

52 153 17/10/2040 TGHS/E/1

DESCRIPTION	BALANCE	AMOUNT
Basic Salary		1,490,000.00
Health Care Society		
Pension		[illegible]
Income Tax		74,000.00
National Hospital Insurance Fund Employer		[illegible]
		44,400.00
NET AMOUNT DUE	[illegible]	1,041,020.00

One Health Coordination Desk (OHCD-PMO) Budget Justification

A. Senior Personnel

We request a total of S14, to support Key Personnel over the five years of the proposed project.

Dr. Justine Assenga, Research Scientist, Molecular Epidemiologist, will commit 0 months per year for which we request salary support of $2 in Year 1, with a 3% increase per annum (p.a.). Dr. Justine Assenga is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk and will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Assenga's time will increase in Y for a total of $7,2 over the five years of the project.

Dr. Jubilate Bernard, Research Scientist, Public Health Specialist, will commit 0 months per year for which we request salary support of $25 in Year 1, with a 3% increase p.a. Dr. Jubilate Bernard is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Bernard's time will increase to months per year in - for a total of S7, over the five years of the project.

D. Travel

We request a total of S3,185 to support local travel for them in Tanzania over the five years of the proposed project.

We request $600 in Y1 so that both Dr. Assenga and Dr. Bernard may attend project meetings held in Tanzania and take other meetings to improve One Health stakeholder relationships.

Travel expenses will increase at a rate of 3% per year over the five years of the project.

H. Indirect Costs

We request a total of S , 5 in overhead over the five years of the project. The rate of overhead will be 10% each year, starting with S11 in Y1.

Deleted: 855

Deleted: 1.

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Deleted: from 1 month to 12 months per year

Deleted: 4-5

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Deleted: Y4

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Deleted: 427

Deleted: for

Deleted: 3

Deleted: 18

Deleted: 0

Budget Documentation – Public Health England

Public Health England

National Infection Services
Manor Farm Road
Porton Down
Salisbury, Wilts
SP4 0JG

T +44 (0)1980 612642

www.gov.uk/phe

Date: 4th November 2019

Melinda Rostal DVM, MPH
Senior Research Scientist
PREDICT 2 Surveillance Coordinator for EcoHealth Alliance
Rift Valley Fever Virus Project Manager
EcoHealth Alliance
460 West 34th Street – 17th Floor
New York, NY 10001

Dear Melinda

Salary confirmation for DTRA CCHF Grant

I hereby confirm that the current per annum salary of our key personnel as of today's date is as follows:

Neil McLeod - £66,609.96

Roger Hewson - £94,889.04

Stuart Dowall – £75,891.24

Kevin Richards - £56,501.28

James Pitman - £53,813.64

Above salaries include oncosts (NI & Pension). Please note the above salaries are subject to annual inflation.

Yours Sincerely

Ian Lang
Senior Finance Manager

Public Health England

National Infections Service
Public Health England
Porton Down
Salisbury
Wilts
SP4 0JG
UK

www.gov.uk/phe

Date: 4th November 2019

Melinda Rostal DVM, MPH
Senior Research Scientist
PREDICT 2 Surveillance Coordinator for EcoHealth Alliance
Rift valley Fever Virus Project Manager
EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

Dear Melinda,

PHE Other Direct Costs (exc. Facilities) confirmation for DTRA CCHF Tanzania grant:

PHE have costed £6,600 (which converted $7,119 in original justification) for materials and supplies to conduct 100 CCHFV virus neutralization assays to confirm the positive ELISA results on the wildlife samples

This budget is broken down as follows:

1. Travel Budget £1500
This would be for senior PHE scientist to attend meeting in the field in Tanzania. The costing is based on a projected flight cost of approx. £800 (see Appendix 1- page 3) with the remainder for travel to/from airports and accommodation and sustenance. PHE involvement would be in 2023/24 so it is not possible at this moment to forecast accurate costs for these items but any shortfall in budget will be covered by PHE.

2. Materials and supplies £3600

Agreed with to supply 100x CCHF virus neutralisation tests for £36 per test.

Materials include CCHF antibodies, IgG, cells and general laboratory consumables.

3. Postage of samples
Samples would be taken from the field laboratory and shipped on dry ice under UN packing code 3373 to PHE Porton Down site. The quotation provided by Dangerous Goods International for each delivery would be £525.60.

This postage cost is £1051.20.

The grand total for all other direct cost would be £6119.34. The costs of the items are based on the current prices. The reason to request the additional £~480 is to cover the inflationary costs over the 4 years between now and when we anticipate activity to start.

Your Sincerely,

Neil McLeod
Senior Scientific Project Manager
Tel: + 44 (01980 619907
Email: neil.mcleod@phe.gov.uk

Select your departure to Dar es Salaam Sat, Apr 11

Prices are roundtrip per person, include all taxes and fees, but do not include baggage fees.

1 Stop | Arrival time - Afternoon (12:00pm - 5:59pm) | LGW (London)

Sort & Filter | Clear | Show flexible dates

Sort by

Price (Lowest)

Stops | From:

1 Stop (31) $850

2+ Stops (70) $717

Airlines included | From:

9:45pm - 2:40pm +1
Emirates
Very Good Flight (8.2/10)
Details & baggage fees

14h 55m (1 stop)
LGW - 2h 40m in DXB - DAR

$1,066 roundtrip
Select

10:00am - 2:40pm +1
Emirates
Poor Flight (4.2/10)
Details & baggage fees

26h 40m (1 stop)
LGW - 14h 15m in DXB - DAR

$1,066 roundtrip
Select

Public Health England

National Infections Service
Public Health England
Porton Down
Salisbury
Wilts
SP4 0JG
UK

www.gov.uk/phe

Date: 4th November 2019

Melinda Rostal DVM, MPH
Senior Research Scientist
PREDICT 2 Surveillance Coordinator for EcoHealth Alliance
Rift valley Fever Virus Project Manager
EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

Dear Melinda,

PHE Briefing Note on current agreements and submissions with DCAA and DCMA for DTRA CCHF Tanzania grant:

PHE have an agreed rate of 37.8% for indirect costs for use on grants, contracts and other agreements with the Federal Government. This is enclosed with email dated 5th November 2019 (Public Health England RA). Please note this is an increase from the 37.5% rate the original costings were based upon, the rate has since been updated since the original proposal was submitted.

This agreement was with the US federal government on behalf of the Department of Health and Human Services. PHE is currently undertaking several contracts funded via US federal agencies NIAID, BARDA and FDA on a range of projects in the area of infectious disease research.

PHE also have a current submission for US-DTRA FRCWMD funding as follows:

Grant agreement: 12753455
Title: Ecological and Epidemiological Investigation of Crimean-Congo hemorrhagic fever virus (CCHFV) in Azerbaijan.
This application is in final stage and is still under consideration. The rate of 37.5% indirect costs was used in the submission.

Your Sincerely,

Neil McLeod

Neil McLeod
Senior Scientific Project Manager
Tel: + 44 (01980 619907
Email:

Public Health England

National Infections Service
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Senior Research Scientist
PREDICT 2 Surveillance Coordinator for EcoHealth Alliance
Rift valley Fever Virus Project Manager
EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

Dear Melinda,

PHE Facilities cost confirmation for DTRA CCHF Tanzania grant:

PHE have costed £5,896 for two weeks use of the high containment biosafety level 4 laboratory at PHE Porton Down site. The standard laboratory rental rate is set at £2948 per week for this laboratory.

The laboratory recharges are generated from a model that allocates a cost based on the specific lab or portion of a lab for the specific time period of use. The cost is a proportion of the total costs of the site allocated to the labs based on the weighted cost of subjective headings.
Table 1 (overleaf, page 2) shows a breakdown of the percentage cost allocations to each heading.

Your Sincerely,

Neil McLeod
Senior Scientific Project Manager
Tel: + 44 (01980 619907
Email:

Table 1. Cost allocations for PHE High Containment BSL-4 laboratory

	%
EMCOR base contract	44.12
Equip Rep & Maint	24.40
Other - Engineering services	14.61
Telecom charges	-
Rates	0.34
Gas Building 1	0.16
Gas Incinerator	-
Gas Process load / autoclave	6.09
Electricity share 1	0.55
Electricity share 2	0.47
Oil	-
Water	0.20
Accom hire	-
Waste Disposal	-
SubCont Fac Mgt	-
Other	-
Security	-
Soft Services Mgt	-
Capital Proj Mgt	2.36
FM Engineering	3.16
Site Mgt	-
Dep Alloc	-
Dep Site	0.40
Dep MB	2.34
Dep all but MB	-
Incinerator	0.50
Site share costs	0.28
	-
Total charge	100.00

Note: EMCOR are our Facilities managers

Public Health England-Porton Down Budget Justification

A. Senior Personnel

We request a total of $ to support Key Personnel (KP) during the project.

Roger Hewson, Ph.D, Research Scientist, Virologist will commit 0. months in OY2 of the project. KP Hewson will engage with project partners, supervise and collate scientific reporting from PHE. We request a total of $.

B. Other Personnel

We request a total of $ to support Other Personnel during the proposed project.

Technicians. Two CL4 laboratory will commit 1 month each in OY2 in order to confirm 100 wildlife samples using virus neutralization assays. CCHFV is a Hazard Group 4 pathogen necessitating work with infectious substances to be carried out at Containment Level 4, and the UK operates a dual worker or buddy system for all laboratory work with HG4 pathogens. We request $ per month for a total of for both

Project Manager. The project manager will commit 0. 5 months in OY2 in order to manage staff and ensure efficient project progress. We request $ in OY2. The project manager will also set up DEFRA license applications for sample transport and liaise with colleagues in Tanzania on sample details.

F. Other Direct Costs

We request a total of $1 ,1 for direct costs during the project.

Materials and Supplies

We will conduct 100 CCHFV virus neutralization assays to confirm the positive ELISA results on the wildlife samples, as this has not previously been assessed for this multispecies commercial ELISA. We request $ in OY2 to conduct the testing

Facility Rental

CCHFV is a Hazard Group 4 pathogen necessitating work with infectious substances to be carried out at Containment Level 4. We request $ in OY2 to support the use of the CL-4 laboratory for 2 weeks in order to complete the testing indicated above.

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H. Indirect Costs

We are requesting the federally agreed indirect cost of % on all direct costs during the project. We request $ in OY2.

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TAWIRI Budget Justification

Key Personnel

We request a total of $13,273 to support Key Personnel over the five years of the proposed project.

Julius Dotto Keyyu, Research Scientist, Disease Ecologist, will commit 1.0 months per year. We request salary of $2, in Year 1, with a 3% increase for Y2-Y5, respectively. Dr. Julius D. Keyyu is a Chief Research Officer who holds a PhD in ecosystem and population health specifically on disease ecology. Dr Keyyu will support the wildlife sampling team, create the animal epidemiological study design, implementation and analysis and facilitate communication with stakeholders.

Other Personnel

We request a total of $ to support Other Personnel over the five years of the proposed project.

will will be paid $60 per day for food an accommodation , working for 0 days ($60 x 0 days) for a total of $7,200, for Year 1 and Year 2 of the project.

Travel

We request a total of $1,59 to support international travel over the five years of the proposed project request $300 in Y1. International travel expenses will increase at a rate of 3% per year throughout the project.

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We

Tanzania Wildlife Research Institute

Head Office P.O. Box 661, Arusha, Tanzania
Tel: +255 (0) 27 254 9571 / 254 8240, Fax: +255 (0) 27 254 8240
E-mail: [redacted]
Website: www.tawiri.or.tz

Our Ref: TWRI RG 22 VOL 69 88 68

Your Ref:

Date: 31 October 2019

Melinda Rostal DVM, MPH
Senior Research Scientist
PREDICT 2 Surveillance Coordinator for EcoHealth Alliance.
Rift Valley Fever Virus Project Manager.
EcoHealth Alliance.
460 West 34th Street – 17th floor.
New York, NY 10001

Dear Melinda.

RE: SALARY FOR DR. JULIUS D. KEYYU AND SUBSISTENCE (NIGHT OUT) ALLOWANCE DURING FIELD WORK

Please refer to the above heading and also to communications regarding implementation of the Crimean Congo Haemorrhagic Fever (CCHF) project.

The Tanzania Wildlife Research Institute (TAWIRI) is a parastatal organisation under the Ministry of Natural Resources and Tourism (TAWIRI) established by Act. No. 4 of 1980 of the Parliament (CAP 260 R.E. 2002), with the mandate to conduct, promote and oversee wildlife research in Tanzania.

This letter is to confirm that the monthly salary of Dr. Julius D. Keyyu is Five Million Eighty Hundred and Eight Thousand Tanzanian Shillings (TZS 5.808.000/=); and that the rate for daily subsistence (night out) allowance during field work as per the Government is TZS 120.000 (USD 60) per day to cater for accommodation and food.

Do not hesitate to contact me in case you need any clarification

Yours sincerely.
TANZANIA WILDLIFE RESEARCH INSTITUTE

Dr. Victor Kakengi
FOR: DIRECTOR GENERAL

TVLA Budget Justification

A. Key Personnel

We request a total of S , to support Key Personnel over the five years of the proposed project.

Dr. Furaha Mramba, Co-PI, Entomologist, will commit 1 month per year. We request salary of S3,000 in Year 1, with a 3% increase for Y2- Y , respectively. Her time increase in Y3 to 6.0 months in order to support the testing of samples in the TVLA laboratory. Co-PI Mramba is the Chief Executive of TVLA and holds a PhD in medical entomology. Co-PI Mramba will conduct or supervise the identification and diagnostic testing of animals and ticks, oversee the design, implementation and analysis of the animal study and facilitate communication with stakeholders.

B. Other Personnel

We request a total of S23, to support Other Personnel over the five years of the proposed project.

Laboratory Technicians.

There will be three technicians, who will who commit months per year in Y1 and Y2 to assist with the installation of the equipment purchased for the TVLA laboratory in Arusha (e.g. generator for the building, an ultrafreezer – see the EcoHealth Alliance Y1 part C for a full list of items to be installed), for which we are requesting $. Salaries will increase 3% in subsequent years. They will commit to months for Y3 in order to assist with the diagnostic testing of samples. For this we are requesting S over the five years of the project.

During Year 3 we will hire three additional technicians to conduct the diagnostic testing of samples and tick identification. This includes one ELISA technician and one PCR technician that will be based in Arusha and who will commit 12 months per year for Y3 to assist with sera and ticks, respectively, for which we request $5, 00 per technician . The technician hired to identify ticks will be contracted for 12 months from the TVLA lab in Tanga, for which we request .

D. Travel

We request a total of S to support travel over the five years of the proposed project.

In order to complete the tick identifications in Y3 of the project, we request $ 0 that will cover -day trips to Arusha. Transportation is calculated at S50 per day (S50/day x trips S 00) and overnights are calculated at an average cost of S per day , for trips of days each (S /day x days x trips = S).

Co-PI Mramba will require one trip per year during Y1, Y2, OY1, and OY2 for project meetings and to visit stakeholders, calculated at $50 per day for transportation, and S per day for days for field visit ($1 per year). During Y3 when there is active laboratory work and tick identifications ongoing, co-PI Mramba will make trips to visit the laboratory in Arusha.

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E. Participant Support Costs

We request a total of $1,800 for a CCIIF Diagnostics Training Workshop held at TVLA during Y3 of the project. These funds will be used to support the travel costs of trainees during 5-day workshop .

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F. Other Direct Costs

We request a total of $13 , for other direct costs over the five years of the proposed project.

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We request $123,89 for testing during Y3 of the project, including PCR testing and serology. We request $30,656 for testing covering 1,200 cattle samples, 1,800 small mammal samples and 200 wildlife samples, at a discounted rate of $9.58 (the rate is discount as the University of Glasgow is providing the multispecies ELISA kits for analysis). We request $93,238 for testing covering 200 wildlife samples and 3296 tick pools, at a cost of 60,000 Tanzanian Shilling, or $26.67 USD, per test.

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We request $10,3 0 over the five years of the project for supplies. There will a cost of $2,000 each year in fuel for the generator to maintain samples (which will begin to be collected in Year 1) at -80°C during power outages.

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In Y3 only, we request $3 0 for a 100 pack of 20 mL Petri dishes.

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H. Indirect Costs

We request a total of $19, in overhead, a rate of 10% per year on other direct costs, over the five years of the proposed project.

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Budget Documentation – Tanzanian Veterinary Laboratory Agency

TANZANIA VETERINARY LABORATORY AGENCY

Tel: +255 22 2861152
Fax:+255 22 2864369
E-mail: furaha58@yahoo.com

All letters should be
Addressed to Chief Executive

TVLA

Veterinary Complex,
131 Nelson Mandela Road,
P.o. Box 9254,
15487 Dar es Salaam,
TANZANIA.

05/11/2019

Please quote
Ref. No. BD/332/372/12

Dear Dr. Melinda,

RE: CONFIRMATION AND JUSTIFICATION OF THE TVLA BUDGET

Senior Personnel.

Dr. Furaha Mramba, a Co-PI, and a Medical Entomologist, will commit 1 month per year. Her monthy salary is documented below and is approximately $3,000 in Year 1, with a 3% increase for Y2-OY2, respectively.

Other Personnel:

The average salary for a general laboratory technician at TVLA Laboratory in Arusha is $450 per month or S5,400 per year.

Travel

We confirm that the **Tanzanian Government Rate per night** is S55 and transportation to Arusha is $50.

Other Direct Costs

TVLA Arusha has agreed to the following diagnostic assay table for the CCHF project.

Assay	Number of Samples	Cost per Assay	Total Cost
ELISA	3200	S9.58	S30,656
PCR	3,496	S26.67	S93,238

We estimate that we will need the generator for 26.6 hours per month (S1.25/L*5hours/L*26.6 hours/month*12 months/year = S2000). In Y3 only, we request $300 for a 100 pack of 20 mL Petri dishes.

Grateful if this request will be considered
Faithfully yours,

Dr Joseph Masambu
DIRECTOROF FINANCE AND ADMINISTRATION – TVLA

Cart

Account: 884930003 EcoHealth Alliance

Item	Price	Qty	Subtotal
Fisherbrand™ Petri Dishes Specialty Catalog number FB0875711 **Type: Deep Dish, Size: 100 x 25mm**	**$160.00 / Case of 325**	2	**$320.00**

In Stock (2) - Estimated delivery 12/03/2019

Order Summary

Subtotal	$320.00
▲ Shipping and Handling *	$26.39
Shipping fuel surcharge	$4.45
Shipping charge	$21.94
Estimated Tax	$0.00

*Extra charges may apply for products that require special services.

Add all items to a list

Generate a Web Quc

View All Quotes | What's this?| missing translation for 'faq'

3

0203

28/11/2019

TANZANIA VETERINARY LABORATORY AGENCY
P O Box 1068 ARUSHA.

Being cost for the construction of a Generator shelter at TVLA, Arusha	USD 1,500,00
	1,500.00

USD 1,500.00

University of Glasgow (UoG)

A. Senior Personnel

We request a total of S to support co-PI/Key Personnel (KP) over the five years of the proposed project.

Sarah Cleaveland, Ph.D., co-PI, will commit 1.2 months (mo.) per annum (p.a.) for all five years, with an increase of approximately (allowing for exchange rates) 3. % annually. We request S1 , in Y1 and $ 9, 6 total. Co-PI Cleaveland will provide key support and oversight for the field epidemiological studies by contributing to the design and implementation of the field study, liaising with partner institutions and stakeholders in Tanzania and linking with policy makers at national, regional and international levels for the dissemination of findings and development of guidelines.

Brian Willett, Ph.D., Research Scientist, Viral Immunologist, will commit 0.6 mo. p.a. for all five years with an increase of approximately 3. % annually. We request $, in Y1 and S , for all five years. Key Personnel Willett will provide oversight, support and training for CCHFV serological and molecular analyses and will coordinate activities with collaborating laboratories (Public Health England, Pirbright Institute).

B. Other Personnel

We request a total of S1 to support Other Personnel over the five years of the proposed project.

Technician. A full-time laboratory technician based in KP Willett's laboratory will commit 3 mo. per year in Y1 2 and OY1. We request S , 5 in Y1 with a 4. % increase annually. The technician will commit 12 mo. per year in Y3 and OY1 as the in-country laboratory work will be conducted during these two years. We request $, 6 in Y3, totalling $, across all five years. The laboratory technician will support the laboratory analyses, including optimisation of assays, and establishment of laboratory diagnostic capacity in Tanzania.

John Claxton, Administrator, will commit 1.2 months p.a. for all five years with an approximately (allowing for exchange rates) % increase annually. We request $,56 in Y1 and a total of $,8 for all five years. Mr. Claxton, a highly experienced international project manager, will provide support for financial management and reporting, sub-contracts and agreements, ethical clearance, procurement and shipment of supplies.

D. Travel

We request a total of S 3, 2 for international travel across all five years.

We request trips per year for either co-PI Cleaveland or the laboratory technician in Y1-OY1. Each trip is estimated S1, 3 flight

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In OY2 we request trip for KP Willett .

We request $, over five years for research visas. We request a permit for the technician in Y1 to assist with the installation of capacity building equipment at TVLA, 2 permits per year in Y2-OY1 for the technician and co-PI Cleaveland and one permit in OY2 for co-PI Cleaveland. We request $2, 0 in Y1 with a 3% increase across all years.

E. Participant Support Costs

We request $3, 00 in Y3 for travel subsistence costs for participants ($5 per day * 5 days * 10 participants *2 trainings). Costs for the UoG trainer are covered by travel costs.

F. Other Direct Costs.

We request a total of $6 , in other direct costs across 5 years.

In Y3 and OY1 we request $ p.a. for the shipment of samples from Tanzania to the University of Glasgow. This is required for quality assurance of assays carried out in Tanzania and based on recent estimates for similar shipments provided by .

We request a total of $58,500 for laboratory across the 5 years. Materials and consumables costs are based upon the average actual annual expenditure (over 4 years) by researchers within this laboratory performing similar experiments to those in the project. These costs were extracted from the University of Glasgow purchasing system Agresso , including antibody reagents, secondary antibody conjugates, specific control sera, buffers, blocking agents and substrates for ELISA. This will produce sufficient reagent to

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facilitate ELISA analyses at KCRI, UoG and the laboratories participating in the workshops. The s e funds will be used to purchase CCHF Multispecies ELISA kits (430 animals can be tested per kit) at the end of Y2 for analyses at TVLA on the 3,200 animal samples in Y3 and a contingency of kits sufficient to process an additional 1000 samples in each of for confirmatory analyses and assay validation at UoG. Thus, we request a sufficient number of kits to test 5, 0 samples over the three years

cell culture plasticware/media for the synthesis and purification of recombinant antigens (for the human ELISA) culture flasks, plates, media and supplements, ELISA plates, plate sealers, reservoirs, pipettes, tips and tubes. This includes using pre-cast polyacrylamide gels, buffers and supplies for the iBlot transfer system, Sarstedt tubes and storage boxes for sera. for molecular biologicals, nucleic acid purification kits, restriction enzymes and kits for mutagenesis and sequencing for vector preparation and cloning, and transfection. Also included in this category are preparing primers and probes for viral detection by real-time PCR for TVLA to use, confirmatory testing primers for sub-cloning and mutagenesis, and small-scale sequence confirmation of plasmid constructs general laboratory supplies, including microcentrifuge tubes, plates, petri dishes, fine chemicals

H. Indirect Costs

We request a total of $43, in overhead, a rate of 10% per year on other direct costs, over the five years of the proposed project.

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We request $2,539 p.a. (Y2-OY1) for

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Budget Documentation – University of Glasgow

University of Glasgow | College of Medical, Veterinary & Life Sciences

One Health Approach to Understanding the Epidemiology of Crimean-Congo Haemorrhagic Fever virus in Tanzania

Dear Mindy,

Please see below salary information, as requested by DTRA.

Name	Basic Annual Starting Salary	Annual Increment Date	Inflationary Uplift 2%
Professor Sarah Cleaveland	$130,046	1st August	1st August
Professor Brian Willets	$100,642	1st August	1st August
Ryan Carter	$31,832	1st May	1st August
John Claxton	$55,644	1st December	1st August

Dr Debbi MacMillan
Senior Project Coordinator

College of Medical, Veterinary and Life Sciences
Room 329, Wolfson Medical School Building
University of Glasgow
Glasgow, G12 8QQ

Email: Debbi.Macmillan@glasgow.ac.uk
Tel: +44 (0)141 330 4105

Web: http://www.gla.ac.uk/colleges/mvls/

Flight costs

Trip Summary

Trip Summary ⌄

Trip Total: **$1,437.96**

Rates are quoted in US dollars

64502 customers protected their flight in the last 7 days. Add flight protection when you check out.

✔ **Nice Job! You picked one of our cheapest flights.**
Book now so you don't miss out on this price!

Mon, Jan 13 **From Glasgow Intl. (GLA)**
To Kilimanjaro Intl. (JRO)

Qatar Airways — Cheapest

5:20pm GLA	→	2:05pm JRO	17h 45m, 2 stops LHR, DOH Arrives Tue, Jan 14

Show flight and baggage fee details ⌄

Mon, Jan 20 **From Kilimanjaro Intl. (JRO)**
To Glasgow Intl. (GLA)

British Airways — Cheapest

3:15pm JRO	→	10:50am GLA	22h 35m, 3 stops DAR, DOH, LHR Arrives Tue, Jan 21

Show flight and baggage fee details ⌄

‹ **Change flights**

Upgrade your flight

Get more comforts and benefits by adding an upgrade.

Kilimanjaro Intl. (JRO) → Glasgow Intl. (GLA)
22h 35m

- Relax while packing! Get free bags
- Enjoy more flexibility with free cancellation
- Choose seats at no extra charge

Show upgrades ⌃

from
+ $752.11
for all travelers

Standard Economy — **Included**
Cabin: Economy/Coach

- Checked Bags
- Seat Choice
- ✔ Carry On Bag
- Cancellation

Expedia

Review your trip

Trip Summary

Trip Summary

Trip Total: **$320.65**

Rates are quoted in US dollars

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Nice Job! You picked one of our cheapest flights.
Book now so you don't miss out on this price!

Mon, Jan 13 **From Kilimanjaro Intl. (JRO)**
To Julius Nyerere Intl. (DAR)

Hahn Air Systems — Cheapest

7:30am JRO	→	1:20pm DAR	5h 50m, 1 stop ZNZ

Show flight and baggage fee details

Mon, Jan 20 **From Julius Nyerere Intl. (DAR)**
To Kilimanjaro Intl. (JRO)

PrecisionAir — Cheapest

3:10pm DAR	→	4:30pm JRO	1h 20m, Nonstop

Show flight and baggage fee details

Change flights

Unlock up to 42% off select hotels when you book this flight
Your discount lasts until your trip starts

Important Flight Information

See more

Continue Booking

64520 customers protected their flight in the last 7 days. Add flight protection when you check out.

Round trip ▾ 1 passenger ▾ Economy ▾

Glasgow GLA ⇄ Dar es Salaam DAR Sun, Jan 5 ‹ › Sat, Jan 11 ‹ ›

Bags ▾ 1 stop or fewer × Airlines ▾ Price ▾ Times ▾ Connecting airports ▾ More ▾

Track prices Date grid Price graph Nearby airports

Departing flights

Total price includes taxes + fees for 1 adult. Additional bag fees and other fees may apply.

Sort by

Emirates	8:50 PM – 3:00 PM+1	15h 10m	1 stop	[illegible]
	[illegible]	GLA–DAR	2h 25m DXB	round trip

1 longer or more expensive flight

LOGICAL PRESENTATION OF REQUIREMENTS FOR APPLICATION OF RESEARCH CLEARANCE AND PERMIT AT COSTECH

The objective of the analysis that led to this presentation was to find a much more easier to understand presentation of the requirements to the prospective applicants.

GENERAL REQUIREMENTS: These apply to all applications

	Item	Foreigners Affiliated to Local Research and Higher Learning Institutions	Others (Tanzanian, Non Tanzanians, affiliated in a foreign country, affiliated locally, etc)
1	Detailed curriculum vitae	Required for all involved researchers	Required for all involved researchers
2	Full research proposal	Required	Required
3	Sponsor cover letter	Required	Required
4	Support letter from local collaborating institution / contact person	Required	Required
5	Recommendation letter for endorsement of the proposed research within the institution	Required	Not applicable
6	Front-page of passport	Required	Required
7	Proof of payment non-refundable application fees	50 USD	50 USD
8	Application form	Required	Required

REQUIREMENTS FOR SPECIFIC SCENARIOS

a) Research related to medical, public health, drugs, clinical trials, and wildlife issues require special clearance from relevant authorities i.e National Institute of Medical Research (NIMR) for the study that involves medical, public health and / or human subject (health); Tanzania Food and Drug Authority for Clinical Trials; and Tanzania Wildlife Research Institute (TAWIRI) for the study that involves wildlife and natural resources conservation.

b) In case of joining a new researcher to an on-going research which has already been granted a research permit, a Principal Investigator shall submit a request of research permit for a new member to COSTECH at least 2 months prior to his/her joining the research team with detailed curriculum vitae, clear justification and roles for an additional staff / researcher to the on-going project.

c) It is anticipated that the PI will remain responsible for the entire lifetime of the project, unless circumstances necessitate a change of PI. In such rare situation the head of hosting research institution shall write to notify COSTECH within 6 months since termination of outgoing PI. This will be done in writing explaining the reason for the changes and suitability of a newly identified PI. The letter requesting for amendment, accompanied by an up to date progress report shall be subjected to approval process before continuing with the research. It is the responsibility of the hosting institution to submit the request for change of PI within specified time.

POST CLEARANCE

a) After the research has been cleared, the PI will be notified by email. All FOREIGNERS who then wishes to undertake research activities in the country under the cleared research project will be required to apply for permit by presenting a proof of payment of research permit fees (300 USD) and three passport size photos.

72181296

The United Republic of Tanzania

MINISTRY OF NATURAL RESOURCES AND TOURISM

Tanzania Wildlife Research Institute (TAWIRI)

Government Bill

Control Number	994330001101
Service Provider Code	SP433
Payer Name	[illegible]
Address	GLASGOW
Payer Phone	[illegible]

General Description

Research fee for [illegible] Lankester to undertake his research Project: Ecosystem Health in Tanzania

Description	Quantity	Unit Price	Amount
Research Fees Non TZ	1	[illegible]	[illegible]
[illegible]	1	[illegible]	[illegible]

Total: 3,800.00 USD

Amount in Words: Three Thousand Eight Hundred

Issued On	[illegible]
Expires On	[illegible]
Prepared By	[illegible]
Printed On	[illegible]
Signature	[illegible]

Jinsi ya Kulipa [illegible]

How to Pay [illegible]

[illegible] 994330001101 [illegible]

[illegible] 994330001101 [illegible]

Shipping Costs

World Courier
AmerisourceBergen

WC Quote Reference:: QED064190516 v2

Information:

Quote for a shipment of::	Non haz RNA & DNA Samples
Customer Account Name::	University of Glasgow
Account Number::	(b)(4)
Customer Contact::	John Claxton
Contact Details::	John.Claxton@glasgow.ac.uk
Client Quote Reference:	N/A

Content:

Packaging Supplies	1 x GDI 30 L with Dry Ice & 1 x Biobag
Temperature	Frozen (Dry Ice)
Date	17-05-19
Completed By	Dionysios Papatheodorou

Conditions:

Validity: This Quote is Valid for 6 Months from the date of Issue

Currency: **GBP**

Terms: Please note our payment terms are 30 days from the date of invoice unless more restrictive terms are advised during account application. A charge of 0.667% per month will apply to past due balances on a per diem basis.

All work is carried out subject to current terms and conditions shown on the HWB. Full conditions are available on http://www.worldcourier.com/wc-conditions-of-carriage By accepting this quote you enter into an agreement to pay according to these terms.

The current Fuel & Security surcharge is: **15.6%**

							Transport:						Packaging, Supply & extra charges				Temperature Monitioring:		Total
							port-to-port			pre- / on-carriage									
	Description:	Origin City, Country	Destination City, Country	Routing:	Estimated Shipment weight	O/W per ½ kg	Base Rate up to 1kg	Est Overweight Charge	Transfer	Origin Driveaway	Destination Driveaway	Fuel & Security 15.6%	Packaging Supplies	Export Brokerage	Other Charges	Tranship Surcharge	Temperature Monitor	Temperature	Price for one shipment including FSS:
1	Non haz RNA & DNA Samples	Moshi / TZA	Glasgow / GBR	Via Transfer	25.0 kg	17.08	870.00	819.84	93.00	319.00	72.00	339.12	295.00	150.00	-	-	N/A	Frozen (Dry Ice)	**2,957.96**

Conditions:

The above quote is subject to variation depending on the final weight of the shipment.
If at the time of shipping the volumetric weight is found to be greater than the actual weight, overweight and the tranship surcharge will be applied using the volumetric weight, v = (L x W x **H**) / 6000, where the dimensions are in cm.
If additional attempts are required due to a rescheduled collection or delivery or to preposition / recover reusable packaging then additional charges will apply.
Final origin and destination drive charges are subject to variation based on exact pick up and delivery locations.
If this information was not provided during the quoting process then the displayed amount will be estimated based on a central point for the named city and subject to change.

Customs Taxes / Duty have not been included in this quote. Taxes/ Duty will be charged where applicable in line with declared Incoterms and in line with Local Legislation
Airline Warehousing and storage charges will be charged in addition when applicable
This Quote is only valid if mentioned when booking
All rates shown are route specific and subject to change depending on any specific collection time and delivery requirements advised at booking
The Fuel & Security surcharge is applied to the base, overweight and driveaway charges only. This rate is reviewed on a quarterly basis & will be charged at the current rate at the time of shipping.

All Quoted charges are exclusive of VAT. Export Brokerage has been added to this quotation if applicable. Any applicable Import Customs Brokerage charges have not been included in this quotation unless specified. Any brokerage services performed by WC will be charged at £81. If WC are invoiced by an external broker for this service then extra charges could apply in addition to this rate.
All Shipments Collected or delivered on a local weekend day or public holiday will incur a surcharge of £90. Weekday shipments collected or delivered between 1900-0700 will incur an after hours surcharge of £25
If additional attempts are required to either collect or deliver shipments or preposition / recover reusable packaging then a charge of £60 + Applicable drive charges will be applied
Charges for reusable packaging (VIP / GTC) may be subject to Extra rental days if the shipment duration exceeds 7 days or if the packaging is not made available on delivery. Dry Ice shipments will be monitrored and replenishments (if required) will be charged in addition to the above quoted amounts.

Notes:

Materials and consumables costs are based upon the average actual annual expenditure (over 4 years) by researchers within this laboratory performing similar experiments to those in the project. These costs were extracted from the University of Glasgow purchasing system Agresso

Account__T	date	Text	Amount GBP	Dollar cost
OTHER LABORATORY SUPPLIE	10/11/17	20057290 Specimen bag	506.00	694.84
MAIL COURIER AND FREIGHT S	10/11/17	carriage	8.55	11.74
OTHER LABORATORY SUPPLIE	10/11/17	20056402 Thermal control unit fibreboard outer refu	16.70	22.93
MAIL COURIER AND FREIGHT S	10/11/17	20056402 Thermal control unit fibreboard outer refu	10.26	14.09
PLASTICWARE	10/11/17	97256	36.30	49.85
SMALL EQUIPMENT (AS CONS	10/12/17	S7108110010100ul 8 channel multichannel pipetteO	340.00	466.89
PLASTICWARE	10/26/17	98215	112.53	154.53
PLASTICWARE	10/26/17	98215	192.10	263.79
BIOCHEMICALS	11/10/17	98695	177.60	243.88
PLASTICWARE	11/14/17	100439	72.60	99.69
PLASTICWARE	11/20/17	101801	73.18	100.49
TISSUE CULTURE AND BACTER	11/20/17	101801	11.00	15.11
OTHER LABORATORY SUPPLIE	11/20/17	101801	5.65	7.76
PLASTICWARE	11/29/17	102403	146.07	200.58
TISSUE CULTURE AND BACTER	11/29/17	102403	13.75	18.88
STATIONERY AND OFFICE SUP	11/29/17	102403	0.40	0.55
BIOCHEMICALS	11/30/17	HWB L4 Lab biochemicals Oct17 for N Logan	8.68	11.92
ORGANIC CHEMICALS	11/30/17	HWB L4 Lab organic chemicals Oct17 for N Logan	0.43	0.59
PLASTICWARE	11/30/17	HWB L4 Lab plasticware Oct17 for N Logan	2.89	3.97
PLASTICWARE	11/30/17	HWB L4 Cell Culture plasticware Oct17 for N Logan	16.71	22.95
OTHER LABORATORY SUPPLIE	11/30/17	HWB L4 Lab other lab supplies Oct17 for N Logan	0.59	0.81
MAIL COURIER AND FREIGHT S	11/30/17	HWB L4 Lab freight Oct17 for N Logan	0.82	1.13
CLEANING MATERIALS	11/30/17	HWB L4 Cell Culture cleaning materials Oct17 for N I	1.87	2.57
CLEANING MATERIALS	11/30/17	HWB L4 Lab cleaning materials Oct17 for N Logan	0.60	0.82
WORKSHOP CONSUMABLES	11/30/17	HWB L4 Cell Culture workshop cons Oct17 for N Loga	13.33	18.30
MAIL COURIER AND FREIGHT S	12/6/17	DHL/3746273661/GLASGOW UNITED KINGDOM	7.62	10.46
MAIL COURIER AND FREIGHT S	12/6/17	DHL/3746273661/GLASGOW UNITED KINGDOM	0.26	0.36
MAIL COURIER AND FREIGHT S	12/6/17	DHL/7574213301/LEEDS UNITED KINGDOM	0.26	0.36
MAIL COURIER AND FREIGHT S	12/6/17	DHL/7574213301/LEEDS UNITED KINGDOM	7.62	10.46
MAIL COURIER AND FREIGHT S	12/6/17	DHL/3746273661/GLASGOW UNITED KINGDOM	76.80	105.46
PLASTICWARE	1/8/18	104669	73.18	100.49
STATIONERY AND OFFICE SUP	1/8/18	104669	0.88	1.21

PLASTICWARE	1/24/18	105736	255.66	351.07
STATIONERY AND OFFICE SUP	1/24/18	105736	0.82	1.13
BONDED ALCOHOLS	1/31/18	HWB L4 Cell Culture bonded alchols Nov17 for N Log	2.46	3.38
BONDED ALCOHOLS	1/31/18	HWB L4 Lab bonded alcohols Dec17 for N Logan	0.75	1.03
DISPOSAL OF CHEMICAL & RAI	1/31/18	HWB L4 Cell Culture disp of chemical waste Nov17 f	0.48	0.66
DISPOSAL OF CLINICAL WASTE	1/31/18	HWB L4 Lab disp of clinical waste Nov17 for N Logar	3.31	4.55
ORGANIC CHEMICALS	1/31/18	HWB L4 Lab organic chemicals Nov17 for N Logan	2.32	3.19
PLASTICWARE	1/31/18	HWB L4 Lab plasticware Nov17 for N Logan	11.30	15.52
PLASTICWARE	1/31/18	HWB L4 Cell Culture plasticware Dec17 for N Logan	90.09	123.71
PLASTICWARE	1/31/18	HWB L4 Cell Culture plasticware Nov17 for N Logan	73.17	100.48
PLASTICWARE	1/31/18	HWB L4 Lab plasticware Dec17 for N Logan	5.79	7.95
OTHER LABORATORY SUPPLIE	1/31/18	HWB L4 Cell Culture other lab supplies Nov17 for N L	14.34	19.69
CLEANING MATERIALS	1/31/18	HWB L4 Cell Culture cleaning materials Dec17 for N	8.42	11.56
CLEANING MATERIALS	1/31/18	HWB L4 Cell Culture cleaning materials Nov17 for N	8.77	12.04
CLEANING MATERIALS	1/31/18	HWB L4 Lab cleaning materials Nov17 for N Logan	5.28	7.25
STATIONERY AND OFFICE SUP	1/31/18	HWB L4 Lab stationery Nov17 for N Logan	0.62	0.85
PLASTICWARE	2/5/18	106442	170.56	234.21
PLASTICWARE	2/8/18	106760	157.34	216.06
BIOCHEMICALS	2/27/18	X8 ZEOCIN 100MGML PACK OF 8 X 125ML	240.78	330.64
BONDED ALCOHOLS	2/28/18	HWB L4 Cell Culture bonded alcohols Jan18 for N Log	2.39	3.28
PLASTICWARE	2/28/18	HWB L4 Cell Culture plasticware Jan18 for N Logan	36.18	49.68
PLASTICWARE	2/28/18	HWB L4 Lab plasticware Jan18 for N Logan	5.05	6.93
COMPUTER CONSUMABLES	2/28/18	HWB L4 Lab computer consumables Jan18 for N Log	4.07	5.59
CLEANING MATERIALS	2/28/18	HWB L4 Cell Culture cleaning materials Jan18 for N L	22.94	31.50
CLEANING MATERIALS	2/28/18	HWB L4 Lab cleaning materials Jan18 for N Logan	1.85	2.54
STATIONERY AND OFFICE SUP	2/28/18	HWB L4 Lab stationery Jan18 for N Logan	0.15	0.21
STATIONERY AND OFFICE SUP	2/28/18	HWB L4 Cell Culture stationery Jan18 for N Logan	0.10	0.14
WORKSHOP CONSUMABLES	2/28/18	HWB L4 Cell Culture workshop consumables Jan18 fc	83.33	114.43
PLASTICWARE	3/5/18	109015	205.03	281.55
PLASTICWARE	3/15/18	109649	109.77	150.74
TISSUE CULTURE AND BACTER	3/15/18	109649	9.00	12.36
TISSUE CULTURE AND BACTER	3/15/18	109649	2.75	3.78
BIOCHEMICALS	3/21/18	110057	120.71	165.76

BIOCHEMICALS	3/31/18	HWB L4 Lab biochemicals Feb18 for N Logan	19.25	26.43
BONDED ALCOHOLS	3/31/18	HWB L4 Lab bonded alchols Feb18 for N Logan	0.77	1.06
DISPOSAL OF CHEMICAL & RAI	3/31/18	HWB L4 Lab disp of chemical waste Feb18 for N Log	0.31	0.43
PLASTICWARE	3/31/18	HWB L4 Cell Culture plasticware Feb18 for N Logan	35.39	48.60
PLASTICWARE	3/31/18	HWB L4 Lab plasticware Feb18 for N Logan	6.21	8.53
OTHER LABORATORY SUPPLIE	3/31/18	HWB L4 Lab other lab supplies Feb18 for N Logan	9.96	13.68
CLEANING MATERIALS	3/31/18	HWB L4 Lab cleaning materials Feb18 for N Logan	7.20	9.89
CLEANING MATERIALS	3/31/18	HWB L4 Cell Culture cleaning materials Feb18 for N	1.87	2.57
STATIONERY AND OFFICE SUP	3/31/18	HWB L4 Lab stationery Feb18 for N Logan	0.62	0.85
BIOCHEMICALS	4/12/18	111183	192.66	264.56
TISSUE CULTURE AND BACTER	4/16/18	111305	15.29	21.00
STATIONERY AND OFFICE SUP	4/16/18	111305	7.10	9.75
BIOCHEMICALS	4/25/18	order number for oligo card required	90.00	123.59
BONDED ALCOHOLS	4/30/18	HWB L4 Cell Culture bonded alcohols Mar18 for N Lo	2.39	3.28
DISPOSAL OF CLINICAL WASTE	4/30/18	HWB L4 Cell Culture disp of clinical waste Mar18 for	1.74	2.39
DISPOSAL OF CLINICAL WASTE	4/30/18	HWB L4 Lab disp of clinical waste Mar18 for N Logar	0.87	1.19
PLASTICWARE	4/30/18	112103	54.89	75.37
PLASTICWARE	4/30/18	HWB L4 Cell Culture plasticware Mar18 for N Logan	74.40	102.17
PLASTICWARE	4/30/18	HWB L4 Lab plasticware Mar18 for N Logan	2.89	3.97
TISSUE CULTURE AND BACTER	4/30/18	112103	2.86	3.93
TISSUE CULTURE AND BACTER	4/30/18	HWB L4 Cell Culture tissue culture Mar18 for N Loga	12.66	17.38
OTHER LABORATORY SUPPLIE	4/30/18	HWB L4 Cell Culture other lab supplies Mar18 for N L	14.34	19.69
LAB EQUIPMENT MAINTENAN	4/30/18	Repairs	142.00	194.99
CLEANING MATERIALS	4/30/18	HWB L4 Cell Culture cleaning materials Mar18 for N	5.29	7.26
WORKSHOP CONSUMABLES	4/30/18	HWB L4 Cell Culture workshop consumables Mar18 f	1.67	2.29
BIOCHEMICALS	5/4/18	1934975 HIGH-FIDELITY MASTER MIX	106.75	146.59
BIOCHEMICALS	5/14/18	1937687 E6300S	124.25	170.62
BIOCHEMICALS	5/17/18	1938305 RABBIT ANTI-HUMAN & LIGHT CHAIN ANTI	98.00	134.57
PLASTICWARE	5/17/18	113025	146.07	200.58
TISSUE CULTURE AND BACTER	5/17/18	113025	8.25	11.33
MAIL COURIER AND FREIGHT S	5/17/18	1938305 RABBIT ANTI-HUMAN & LIGHT CHAIN ANTI	30.00	41.20
PLASTICWARE	5/23/18	113380	109.77	150.74
PLASTICWARE	5/30/18	113791	73.18	100.49

TISSUE CULTURE AND BACTER	5/30/18	113791	22.22	30.51
DISPOSAL OF CHEMICAL & RAI	5/31/18	HWB L4 Cell Culture disp of chemical waste Apr18 fc	34.42	47.27
PLASTICWARE	5/31/18	HWB L4 Cell Culture plasticware Apr18 for N Logan	44.37	60.93
OTHER LABORATORY SUPPLIE	5/31/18	HWB L4 Lab other lab supplies Apr18 for N Logan	1.78	2.44
OTHER LABORATORY SUPPLIE	5/31/18	HWB L4 Cell Culture other lab supplies Apr18 for N L	2.03	2.79
CLEANING MATERIALS	5/31/18	HWB L4 Lab cleaning materials Apr18 for N Logan	1.50	2.06
CLEANING MATERIALS	5/31/18	HWB L4 Cell Culture cleaning materials Apr18 for N I	7.18	9.86
STATIONERY AND OFFICE SUP	5/31/18	HWB L4 Lab stationery Apr18 for N Logan	0.62	0.85
WORKSHOP CONSUMABLES	5/31/18	HWB L4 Lab workshop consumables Apr18 for N Log	0.06	0.08
WORKSHOP CONSUMABLES	5/31/18	HWB L4 Cell Culture workshop consumables Apr18 fc	42.22	57.98
BIOCHEMICALS	6/6/18	114194	28.80	39.55
PLASTICWARE	6/6/18	114180	218.96	300.68
OTHER LABORATORY SUPPLIE	6/7/18	114316	15.16	20.82
BIOCHEMICALS	6/13/18	114716	52.50	72.09
TISSUE CULTURE AND BACTER	6/13/18	114716	8.25	11.33
OTHER LABORATORY SUPPLIE	6/13/18	114316	45.48	62.45
STATIONERY AND OFFICE SUP	6/13/18	114716	0.34	0.47
PLASTICWARE	6/18/18	114954	109.77	150.74
PLASTICWARE	6/26/18	115526	146.36	200.98
TISSUE CULTURE AND BACTER	6/26/18	115526	8.14	11.18
TISSUE CULTURE AND BACTER	6/26/18	115526	16.50	22.66
PLASTICWARE	6/28/18	115713	133.68	183.57
BIOCHEMICALS	6/30/18	Transfer Garscube stores order 111897 for biochemi	130.26	178.87
BONDED ALCOHOLS	6/30/18	HWB L4 Cell Culture bonded alcohols May18 for N Lo	1.08	1.48
INORGANIC CHEMICALS	6/30/18	HWB L4 Lab inorganic chemicals May18 for N Logan	0.73	1.00
PLASTICWARE	6/30/18	Transfer Garscube stores orders 99847/102244/1027	1103.06	1514.72
PLASTICWARE	6/30/18	HWB L4 Cell Culture plasticware May18 for N Logan	91.23	125.28
PLASTICWARE	6/30/18	HWB L4 Lab plasticware May18 for N Logan	6.67	9.16
TISSUE CULTURE AND BACTER	6/30/18	Part transfer Garscube stores order 104245 for tissu	10.10	13.87
OTHER LABORATORY SUPPLIE	6/30/18	HWB L4 Lab other lab supplies May18 for N Logan	1.31	1.80
OTHER LABORATORY SUPPLIE	6/30/18	HWB L4 Cell Culture other lab supplies May18 for N I	12.90	17.71
OTHER LABORATORY SUPPLIE	6/30/18	CVR Communal Consumable Charge 2017/18 for B W	1000.00	1373.20
OTHER LABORATORY SUPPLIE	6/30/18	CVR Communal Consumable Charge 2017/18 for M H	667.00	915.92

CLEANING MATERIALS	6/30/18	HWB L4 Lab cleaning materials May18 for N Logan	18.47	25.36
CLEANING MATERIALS	6/30/18	HWB L4 Cell Culture cleaning materials May18 for N	18.90	25.95
BONDED ALCOHOLS	7/31/18	HWB L4 Cell Culture bonded alcohols Jul18 for N Log	4.30	5.90
BONDED ALCOHOLS	7/31/18	HWB L4 Lab bonded alcohols Jul18 for N Logan	2.44	3.35
BONDED ALCOHOLS	7/31/18	HWB L4 Lab bonded alcohols Jun18 for N Logan	3.08	4.23
DISPOSAL OF CHEMICAL & RAI	7/31/18	HWB L4 Lab disp of chemical waste Jun18 for N Loga	45.64	62.67
DISPOSAL OF CLINICAL WASTE	7/31/18	HWB L4 Cell Culture disp of clinical waste Mar18 adj	-3.48	-4.78
DISPOSAL OF CLINICAL WASTE	7/31/18	HWB L4 Lab disp of clinical waste Mar18 adj for N Lo	-1.74	-2.39
DISPOSAL OF CLINICAL WASTE	7/31/18	HWB L4 Lab disp of clinical waste Nov17 adj for N Lo	-6.62	-9.09
INORGANIC CHEMICALS	7/31/18	HWB L4 Cell Culture inorganic chemicals Jul18 for N	2.22	3.05
ORGANIC CHEMICALS	7/31/18	HWB L4 Lab organic chemicals Jul18 for N Logan	0.86	1.18
PLASTICWARE	7/31/18	HWB L4 Cell Culture plasticware Jun18 for N Logan	232.54	319.32
PLASTICWARE	7/31/18	HWB L4 Cell Culture plasticware Jul18 for N Logan	303.62	416.93
PLASTICWARE	7/31/18	HWB L4 Lab plasticware Jun18 for N Logan	15.40	21.15
PLASTICWARE	7/31/18	HWB L4 Lab plasticware Jul18 for N Logan	9.73	13.36
TISSUE CULTURE AND BACTER	7/31/18	HWB L4 Lab tissue culture Jul18 for N Logan	61.02	83.79
OTHER LABORATORY SUPPLIE	7/31/18	HWB L4 Cell Culture other lab supplies Jun18 for N Lo	0.54	0.74
CLEANING MATERIALS	7/31/18	HWB L4 Cell Culture cleaning materials Jul18 for N L	4.93	6.77
CLEANING MATERIALS	7/31/18	HWB L4 Lab cleaning materials Jun18 for N Logan	2.48	3.41
CLEANING MATERIALS	7/31/18	HWB L4 Lab cleaning materials Jul18 for N Logan	2.16	2.97
CLEANING MATERIALS	7/31/18	HWB L4 Cell Culture cleaning materials Jun18 for N l	19.28	26.48
STATIONERY AND OFFICE SUP	7/31/18	HWB L4 Lab stationery Jun18 for N Logan	1.24	1.70
WORKSHOP CONSUMABLES	7/31/18	HWB L4 Cell Culture workshop consumables Mar18 a	-3.34	-4.59
WORKSHOP CONSUMABLES	7/31/18	HWB L4 Cell Culture workshop cons Oct17 adj for N l	-26.66	-36.61
WORKSHOP CONSUMABLES	7/31/18	HWB L4 Cell Culture workshop consumables Apr18 a	-84.44	-115.95
OTHER JANITORIAL COSTS	7/31/18	HWB L4 Lab other janitorial costs Jul18 for N Logan	7.62	10.46
OTHER JANITORIAL COSTS	7/31/18	HWB L4 Cell Culture other janitorial costs Jul18 for N	23.78	32.65
TISSUE CULTURE AND BACTER	8/20/18	119591	8.28	11.37
PLASTICWARE	8/29/18	120084	146.07	200.58
OTHER LABORATORY SUPPLIE	8/30/18	Tempus Blood RNA Tube	2302.80	3162.20
BIOCHEMICALS	9/6/18	SP5020 10 X casein solution	78.00	107.11
PLASTICWARE	9/12/18	120748	133.68	183.57
TISSUE CULTURE AND BACTER	9/12/18	120748	3.08	4.23

OTHER LABORATORY SUPPLIE	9/12/18	120748	14.46	19.86
OTHER LABORATORY SUPPLIE	9/13/18	6066759 Steadylite plus 1000ml kit as per quote 215	982.13	1348.66
MAIL COURIER AND FREIGHT	9/13/18	6066759 Steadylite plus 1000ml kit as per quote 215	17.25	23.69
PLASTICWARE	9/21/18	121304	170.27	233.81
TISSUE CULTURE AND BACTER	9/21/18	121304	22.86	31.39
LAB EQUIPMENT MAINTENAN	9/27/18	1450-471/normalisation standard/QUOTE 21570833	390.00	535.55
MAIL COURIER AND FREIGHT	9/27/18	1450-471/normalisation standard/QUOTE 21570833	35.00	48.06
BIOCHEMICALS	9/30/18	HWB L4 Lab biochemicalsAug18 for N Logan	19.80	27.19
BONDED ALCOHOLS	9/30/18	HWB L4 Cell Culture bonded alcohols Aug18 for N Lo	2.15	2.95
ORGANIC CHEMICALS	9/30/18	HWB L4 Lab organic chemicals Aug18 for N Logan	2.03	2.79
PLASTICWARE	9/30/18	HWB L4 Cell Culture plasticware Aug18 for N Logan	85.51	117.42
PLASTICWARE	9/30/18	HWB L4 Lab plasticware Aug18 for N Logan	13.64	18.73
TISSUE CULTURE AND BACTER	9/30/18	HWB L4 Lab tissue culture Aug18 for N Logan	19.96	27.41
OTHER LABORATORY SUPPLIE	9/30/18	HWB L4 Lab other lab supplies Aug18 for N Logan	0.23	0.32
CLEANING MATERIALS	9/30/18	HWB L4 Lab cleaning materials Aug18 for N Logan	1.25	1.72
CLEANING MATERIALS	9/30/18	HWB L4 Cell Culture cleaning materials Aug18 for N	3.64	5.00
OTHER JANITORIAL COSTS	9/30/18	HWB L4 Lab other janitorial costs Aug18 for N Logan	6.88	9.45
Total			**£ 14,067.33**	**$ 19,317.26**

IDvet
Innovative Diagnostics

Document N°	Account Nr	Account name		Date
CD184356	(b)(4)	UNIGLASGOW	F	15/10/2018
Reference				
1983619				

Order confirmation

Tel: +33(0)4 67 41 49 33 Fax: +33(0)4 67 45 36 95

Email : info@id-vet.com
Site : www.id-vet.com

Your contact : **Anna Greatrex (Int.** **Katja NOOR COROUGE**

Delivery address :

The Store -School of Veterinary Medicine
Level 1 Urquhart Building
Garscube Estate
464 Bearsden Road
G61 1QH Glasgow

ROYAUME UNI

Attention :

Invoicing Address

University of Glasgow - Finance Office
Main Building, East Quadrangle
G12 8QQ Glasgow, Scotland
ROYAUME UNI

Tel :
Fax :

VAT : GB 671 798 093
Siret :

	Code	Designation	Qty	Unit Price	% Discount	Net Price	Amount
001	CCHFDA-5P-E23	ID Screen® CCHF Double Antigen Multi-species	1,00	1 060,00		1 060,00	1 060,00
	Exp. : 09/2020	5 Plates - Double Antigen					

Total Qty : 1,00

Transport	Incoterms ® 2010
FEDEX	DAP Glasgow

Orders are generally sent within 48 hours

Ship :	30,00	Amount	EUR 1 090,00
Amount subjected to VAT :			
Exo :	1 090,00	**TOTAL**	EUR 1 090,00

Payment terms: Swift Bank Transfer at 30 days

IDvet
Innovative Diagnostics

310 rue Louis Pasteur - 34790 GRABELS - France
SIRET 478 123 219 00022 APE 7211Z TVA FR 17478123219

Coordonnées bancaires : Banque Dupuy de Parseval Montpellier
Code Banque 12939 Code Guichet 00031 N°Compte 40000760577 Clé 27
IBAN FR76 1293 9000 3140 0007 6057 727 SWIFT BIC : BDUPFR2S

New account in Dollars : HSBC Montpellier code banque 30056 code guichet 00967 n°compte 09670001413 clé : 64
IBAN : FR76 3005 6009 6709 6700 0141 364 SWIFT BIC CCFRFRPP

Budget Justification

Moved down [2]: Budget Justification

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Washington State University /
WSU Global Animal Health Tanzania (GAHT)

Note: Cost calculations are rounded to nearest dollar

Senior/Key Personnel
Dr. Felix Lankester, Co-Investigator, 2.4 cal. mo. (years 1-2); 2.0 cal. mo. (years 3-5).
Dr. Lankester is a Clinical Assistant Professor at Washington State University's Paul G. Allen School for Global Animal Health. Now based in the UK, Dr. Lankester has conducted zoonotic disease research since 2009 and has extensive experience with project leadership within the African and One Health research contexts. He serves as Country Representative of WSU's non-profit subsidiary Global Animal Health Tanzania (GAHT), legally registered in Tanzania to facilitate in-country research and support research capacity-building activities on zoonotic infectious diseases. Dr. Lankester will commit 20% effort to the project in Years 1-2 and 16.67% effort in Years 3-5. He will oversee all GAHT activities and supervise GAHT project staff, assist in the coordination of the field activities, serve as liaison with high level Ministerial collaborators and interested parties within the Government of the United Republic of Tanzania, and will collaborate with the PI on data analysis and the drafting of manuscripts, reports and policy documents.
Salary request for Dr. Lankester is $26,192 in Year 1 and budgeted to inflate at 3% annually.
Fringe benefits for Dr. Lankester are calculated at 18% of salary. Year 1 request: $4,715

Senior/Key Personnel Total, 5-year project period: $147,198

B. Other Personnel
WSU Global Animal Health Tanzania (GAHT) maintains an office in Arusha, TZ, to support WSU investigators [1]

Moved (insertion) [1]

Moved up [1]: Travel support within Tanzania is also requested for Dr. Lankester and the Project Coordinator to carry out project activities. Dr. Lankester's travel includes:
Two road trips, 3 days each in Years 1 and 2 to field sites to oversee animal health team activities and sampling procedures. Year 1 budget includes lodging and meal per diem ($157/day x 3 days x 2 trips = $942) and fuel for 720 km per trip ($150 x 2 trips = $300) = $1,242; 3% inflation in Year 2.
One 2-day trip in Years 1 and 2 to visit the wildlife sampling field team. Year 1 costs include return flight Arusha to Seronera ($241) and lodging and per diem ($157/day x 2 days = $314): $555; budgeted with 3% inflation Year 2.
Field visits, Years 1 and 2, total $3,648.

One trip, 2 days each annually to Dar es Salaam and/or Dodoma for meetings with United Republic of Tanzania Ministry officials and other stakeholders. Year 1 costs

Budget Documentation – Washington State University


WSU AIS - wc3270
PPDS2310 DEPPS System 17:21:20 11/12/19
NS AP SL Employee/Appointment Select
WSU No 11363621
Name LANKESTER,FELIX
Appointments as of 10/22/19
Sel Posn Titl CSR Title Begin End FT Rate FTE Pay Rate TTPSLAymTytvcp Dept
1 114893 0267 010119 093021 10913.44 1.0000 10913.44/M E Y7NY 8670
Enter Sel number and press <Enter>
Page 1 of 1
Command ==>
PF4 = PF Key Help PF6 = Picklist PF12 = Menu
4B
SWTC13652
023/014

WASHINGTON STATE UNIVERSITY

Global Animal Health - Tanzania

August 1st, 2019

Godfrey A. Kassanga
Mjimwema Area/Kigamboni
Dar es salaam
TANZANIA

Dear Godfrey Kassanga,

RE: APPOINTMENT AS ADMINISTRATIVE MANAGER FOR GLOBAL ANIMAL HEALTH TANZANIA

The Washington State University-Global Animal Health Tanzania (GAHT) program is pleased to offer you the position indicated below.

Position Title:	Administrative Manager	
Working Title:	Administrative Manager	
Place of Recruitment:	Arusha	
Location of work:	Global Animal Health Tanzania, Uzunguni Area, Sekou Toure Road, Gymkhana, Arusha	
Reporting:	School for Global Animal Health, Director of Finance and Administration	
Appointment Duration:	1st of September 2019 to 31st of August 2020	
Gross Monthly Salary:	5,762,000 TZS	$2,516.68
Start Date:	1st of September, 2019	

Your position is responsible for the overall administrative coordination of Global Animal Health Tanzania (GAHT), a Non-Governmental Organization (NGO) in Arusha, Tanzania. In this position you will serve as the primary financial and personnel officer for GAHT and will operate with a broad level of independent judgment and decision making authority. You will report directly to the Paul G. Allen School for Global Animal Health, Director of Finance and Administration, an academic unit of Washington State University. You will manage the administrative functions of GAHT personnel, procurement, contracts, and finance units for GAHT. You will also manage the requisite NGO registrations and official documents, ensuring all are in order and filed with the respective United Republic of Tanzania agencies. Your responsibilities include assisting the Director of Finance and Administration and the President of

Global Animal Health-Tanzania: Improving Public Health and Catalyzing Human Opportunity
Rivergardens Business Park, Usa River, Arusha
PO Box 1642, Arusha, Tanzania
Telephone: Office Line +255-688521020
www.globalhealth.wsu.edu

GAHT in the development of long-and-short-term strategic plans for GAHT as a sustainable and responsive NGO, leading and managing administrative activities associated with the GAHT office, and ensuring operations are aligned with GAHT and Washington State University policies and procedures as well as in compliance with United Republic of Tanzania laws, regulations, and policies.

A detailed description of the position scope of work is provided in the position description that will be given to you upon reporting.

Note: **See attached position description**

The terms of engagement are as follows:

1. **Engagement Duration:** The period of service is for one (1) year from the start date indicated herein above (1st of September, 2019 to 31st of August, 2020), on a renewable basis upon consultation with and advice from the Director of Finance and Administration and approval of the officers of GAHT. Renewal is not automatic and no action or omission by the GAHT program or its management shall constitute or support any expectation of renewal, even where you may have had a previous renewal of contract.

3. **Working Hours:** The normal working hours are 40 hours a week from 8:00am to 5:00pm, with one-hour lunch break, from Monday to Friday. At times you will be expected to work outside of the normal working hours, however the position is not eligible for overtime due to the senior level of the employment. You will have teleconference meetings, normally weekly, with the Paul G. Allen School for Global Animal Health administrative team as well as with faculty engaged in research in Tanzania. These meetings, due to time zone difference, are likely to be scheduled outside of your normal working hours.

4. **Salary:** You will be paid a Gross Monthly Salary of 5,762,000 TZS. The salary is paid in arrears at the end of each working month for the duration of engagement as per the employment contract.

The said gross salary shall be subjected to statutory deductions as provided in relevant Legislation including but not limited to PAYE (income tax) and pension deductions.

5. **Benefits:** In addition to the salary, you will receive health insurance that you can enlist up to four immediate dependents who must be either your spouse or your legal child (biological child, legally adopted child or a child over whom you have a court mandated guardianship or custody).

6. **Annual Leave:** You will be entitled to annual leave of 22 days per year. These should be utilized within the duration of the contract through mutual agreement between you and your supervisor. You are also entitled to sick leave, maternity leave and compassionate leave as stipulated by law.

7. **Confidentiality:** During and after the term of employment (unless expressly authorized in writing) all information respecting the organization, management, policy, finances and others shall be confidential and not subject to disclosure to 3rd parties.

You will be required to complete training regarding prevention of discrimination and sexual harassment within six months of your date of hire. Information regarding this training is available at the following web site: hrs.wsu.edu/dshp.

All GAHT employees are required to adhere to the institution's policies and procedures. Please return a copy of this letter to Dr. Guy Palmer, President of GAHT, indicating whether you accept or decline the offer, not later than the 12th of August, 2019.

We are confident you will find this opportunity both challenging and rewarding, and we are delighted that you have chosen to pursue your career with the Global Animal Health Tanzania program.

Sincerely,

Dr. Guy Palmer
Regents Professor
Senior Executive Director, Global Health
Washington State University
President, Global Animal Health-Tanzania

Rebecca Manning
Director of Finance and Administration
School for Global Animal Health
Secretary-Treasurer, Global Animal Health Tanzania

Acceptance

I, Godfrey Abdi Kasenga (ID NO. 19790707-11465
do hereby accept ~~decline~~ (delete whichever is not applicable) the appointment and terms provided thereto

Signature

August 5, 2019.
Date

March 22, 2019

Sarah Mollel
P.O. Box 772,
Arusha, Tanzania

Dear Sarah Mollel,

RE: APPOINTMENT AS PROGRAM COORDINATOR FOR GAHT

The Washington State University-Global Animal Health Tanzania (GAHT) program is pleased renew your position as indicated below.

Position Title:	Program Coordinator	
Working Title:	Country Coordinator	
Place of Recruitment:	Arusha	
Location of work:	Global Animal Health Tanzania, Uzunguni Area, Sekou Toure Road, Gymkhana, Arusha	
Reporting:	School for Global Animal Health Administrative Manager	
Appointment Duration:	16th April, 2019 to 15th April, 2020	
Gross Monthly Salary:	4,095,793.97 TSH	$1788.93
Start Date:	16th of April 2019	

The position provides coordination and oversight for the numerous research projects that are carried out by Washington State University (WSU) and GAHT employees in Tanzania. Responsibilities include overseeing the purchase of supplies, disbursing funds, maintaining financial records for each project, managing reimbursements, processing payroll, managing all in country banking issues, working closely with in country auditors and legal counsel, assisting researchers in various research activities, organizing project related meetings and seminars, and managing the Arusha based GAHT office. Your position will report directly to School for Global Animal Health Administrative Manager. Additionally, you will receive direction and leadership from GAHT officers and WSU faculty coordinating research in Tanzania, and from the Washington State University administrative team, most directly from School for Global Animal Health Fiscal Analyst 3.

A detailed description of the position scope of work is provided in the position description.
Note: **See attached position description**

The terms of engagement are as follows:

1. Engagement Duration: The period of service is for one (1) year from the start date indicated herein above (16 April 2019 to 15 April 2020), on a renewable basis upon consultation with and advice from the GAHT officers,and Administrative Manager Rebecca Manning. The contemplated renewal is not automatic and no action or omission by the GAHT program or its management shall constitute or support any expectation of renewal even where you may have had a previous renewal of contract.

3. Working Hours: The normal working hours are 40 hours a week from 8:00am to 5:00pm, with one-hour lunch break, from Monday to Friday. At times the Program Coordinator will be expected to work outside of the normal working hours, however the position is not eligible for overtime due to the senior level of the employee. Weekly you will have skype meetings, which due to time zone difference are likely to be scheduled outside of normal working hours, with WSU Research faculty and administrative team.

4. Salary: You will be paid a Gross Monthly Salary of 4,095,793.97 TZS. The salary is paid in arrears at the end of each working month for the duration of engagement as per the employment contract.

The said gross salary shall be subjected to statutory deductions as provided in relevant Legislation including but not limited to PAYE (income tax) and pension deductions.

5. Benefits: In addition to the salary, you will receive health insurance that can enlist up to four immediate dependents who must be either your spouse or your legal child (biological child, legally adopted child or a child over whom you have a court mandated guardianship or custody).

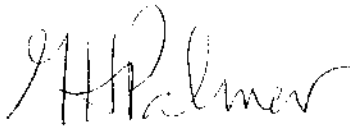
6. Annual Leave: You will be entitled to annual leave of 22 days per year. These should be utilized within the duration of the contract through mutual agreement between you and WSU research faculty. The employee is also entitled to sick leave, maternity leave and compassionate leave as stipulated by law.

7. Confidentiality: During and after the term of employment (unless expressly authorized in writing) all information respecting the organization, management, policy, finances and others shall be confidential and not subject to disclosure to 3rd parties.

All GAHT employees are required to adhere to the institution's policies and procedures. Please return a copy of this letter to Dr. Guy Palmer President of GAHT, indicating whether you accept or decline the offer, not later than April 15, 2019.

We are confident you will find this opportunity both challenging and rewarding, and we look forward to continuing to work with you at the Global Animal Health Tanzania program.

Sincerely,



Dr. Guy Palmer
Regents Professor
Senior Executive Director, School for Global Animal Health at Washington State University
President, Global Animal Health-Tanzania

Acceptance

I, Sarah Mollel ..... (ID NO. 11592849 .....)
do hereby accept /decline (delete whichever is not applicable) the appointment and terms provided thereto

April 11th 2019

Signature

Date

Date

Name
Address

Dear,

RE: APPOINTMENT AS PROJECT VETERINARIAN FOR GAHT

The Washington State University-Global Animal Health Tanzania (GAHT) program is pleased to offer you the position indicated below.

Position Title:	Project Veterinarian
Place of Recruitment:	Arusha
Location of work:	Arusha and Meru Region, Tanzania
Reporting:	Dr. Felix Lankester
Appointment Duration:	One year
Gross Monthly Salary:	5,446,800 Tsh $2,379
Start Date:	XXXX

The role of the Project Veterinarian is to participate in field activities for collection of biological samples from livestock and wildlife species, including collection of samples and management of sample transport to laboratory facilities, and collection of survey data.

The terms of engagement are as follows:

1. **Engagement Duration:** The period of service is for one (1) year from the start date indicated herein above (xx/xx/xxxx to xx/xx/xxxx). The Contemplated renewal is not automatic and no action or omission by the GAHT program or its management shall constitute or support any expectation of renewal even where you may have had a previous renewal of contract. You also recognize that your position may be retrenched in the event of cessation or reduction funding and you accept that you will be retrenched by being given one (1) month notice and other minimum terms required by local legislation.

2. **Working Hours:** The normal working hours are 40 hours a week from 8:30am to 5:30pm, with one-hour lunch break, from Monday to Friday. Occasionally you may be required to work beyond 40 hours and anything beyond 45 hours per week shall be considered overtime. Overtime shall be paid in accordance with local legislation requirements but only in instances where you have received prior written approval to work overtime.

3. Salary: You will be paid a Gross Monthly Salary of 5,446,800 Tsh. The salary is paid in arrears at the end of each working month for the duration of engagement as per the employment contract.

The said gross salary shall be subjected to statutory deductions as provided in relevant Legislation including but not limited to PAYE (income tax) and pension deductions.

4. Benefits: In addition to the salary, you will receive health insurance that can enlist up to four immediate dependents who must be either your spouse or your legal child (biological child, legally adopted child or a child over whom you have a court mandated guardianship or custody).

5. Annual Leave: Upon completing 12 months of continuous service, you will be entitled to annual leave of 28 consecutive days per year. These should be utilized within the duration of the contract through mutual agreement between you and the Country Director. Employees are also entitled to sick leave, maternity leave, paternity leave and compassionate leave as stipulated by law and clarified in the Employee Handbook.

6. Bereavement: In the case where the employee losses his immediate family member (child or spouse) the organization will provide 1,000,000Tsh as a support to the employee. Furthermore, when the employee dies GAHT will assist the family on funeral arrangements by providing them with 3,000,000Tsh.

7. Confidentiality: During the term of employment, (unless expressly authorized in writing) all information respecting the organization, management, policy, finances and others shall be confidential and not subject to disclosure to third parties.

All GAHT employees are required to adhere to the institution's policies and procedures as issued from time to time.

Please return a copy of this letter to the GAHT Country Coordinator, indicating whether you accept or decline the offer by XXXX.

We are confident you will find this new opportunity both challenging and rewarding, and are delighted that you have chosen to pursue your career with the Global Animal Health Tanzania program.

Sincerely,

.....

Dr. Guy Palmer
Regents Professor
Washington State University
Chairperson, Global Animal Health-Tanzania

Acceptance

I, ... do hereby accept /decline (delete whichever is not applicable) the appointment and terms provided thereto.

_____ _____

Signature Date

Date

Name
Address

Dear,

RE: APPOINTMENT AS FIELD ASSISTANT FOR GAHT

The Washington State University-Global Animal Health Tanzania (GAHT) program is pleased to offer you the position indicated below.

Position Title:	Field Assistant
Place of Recruitment:	Arusha
Location of work:	Arusha and Meru Region, Tanzania
Reporting:	Dr. Felix Lankester or Country Director
Appointment Duration:	One year
Gross Monthly Salary:	1,144,800 Tsh $1000
Full time equivalent:	50%
Start Date:	XXXX

The role of the Field Assistant is to drive project vehicles and assist with field activities.

The terms of engagement are as follows:

1. Engagement Duration: The period of service is for one (1) year from the start date indicated herein above (xx/xx/xxx to xx/xx/xxx). The Contemplated renewal is not automatic and no action or omission by the GAHT program or its management shall constitute or support any expectation of renewal even where you may have had a previous renewal of contract. You also recognize that your position may be retrenched in the event of cessation or reduction funding and you accept that you will be retrenched by being given one (1) month notice and other minimum terms required by local legislation.

2. Probation: You shall be subjected to a three-month probation period, after which a performance assessment will be conducted by the Country Director. Confirmation of appointment is subject to the satisfactory completion of the probationary period and approval by the Country Director.

During the probation period either party may terminate the contract for whatever reason upon giving one (1) week notice in writing or payment in lieu of such notice.

Thereafter either party may terminate the contract upon giving a minimum of 28 days' notice in writing or payment in lieu of such notice

3. **Working Hours:** The Field Assistant is expected to work the equivalent of 50% of a 40 hour per week full-time appointment. As this is not a full-time position, the hours of work will vary from week to week.

4. **Salary:** You will be paid a Gross Monthly Salary of 1,144,800 Tsh. The salary is paid in arrears at the end of each working month for the duration of engagement as per the employment contract.

The said gross salary shall be subjected to statutory deductions as provided in relevant Legislation including but not limited to PAYE (income tax) and pension deductions.

5. **Annual Leave:** Upon completing 12 months of continuous service you will be entitled to annual leave of 6 working days per year. These should be utilized within the duration of the contract through mutual agreement between you and the Country Director. Employees are also entitled to sick leave, maternity leave, paternity leave and compassionate leave as stipulated by law and clarified in the Employee Handbook.

6. **Confidentiality:** During the term of employment, (unless expressly authorized in writing) all information respecting the organization, management, policy, finances and others shall be confidential and not subject to disclosure to third parties.

All GAHT employees are required to adhere to the institution's policies and procedures. These policies are summarized in the Employee Handbook, which will be issued to all employees.

Please return a copy of this letter to the GAHT Country Director, indicating whether you accept or decline the offer, not later than XXXX.

We are confident you will find this new opportunity both challenging and rewarding, and are delighted that you have chosen to pursue your career with the Global Animal Health Tanzania program.

Sincerely,

.....

Dr. Guy Palmer
Regents Professor
Washington State University
Chairman, Global Animal Health-Tanzania

Acceptance

I, ...do hereby accept /decline (delete whichever is not applicable) the appointment and terms provided thereto.

_____ _____

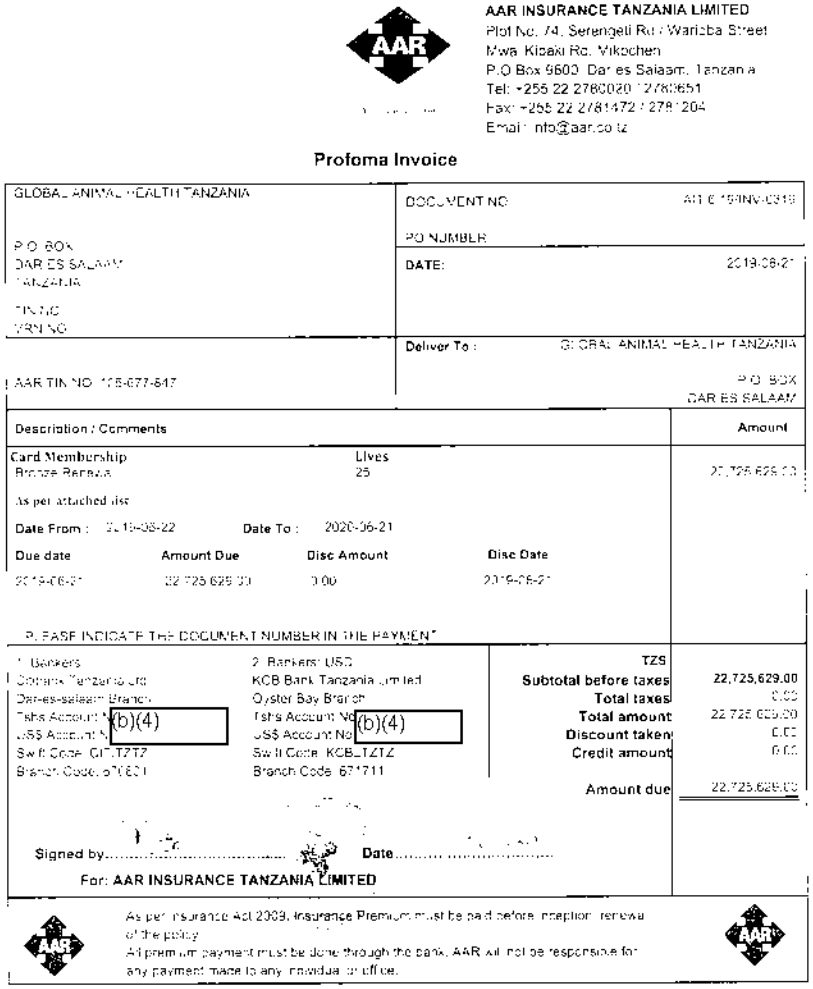
Signature Date

HEALTH INSURANCE AND OTHER BENEFITS COSTS FOR GAHT EMPLOYEES

There are three major benefits for GAH employees (local staff) as follows;

1. 22 days per year as annual leave
2. 10% of gross salary as social security contribution, and
3. Health insurance for staff and up to 4 immediate dependents (spouse and children). The annual health insurance is TZS 22,725,629 equivalent to USD 9,900. Below is the proof of payments of Health Insurance for GAHT 7 employees for the period June 2019 – June 2020.

Paid 20,574,101.40 for field team's insurance



AAR INSURANCE TANZANIA LIMITED
Plot No. 74, Serengeti Rd / Waziba Street
Mwai Kibaki Rd, Mikocheni
P.O Box 9600, Dar es Salaam, Tanzania
Tel: +255 22 2780020 / 2780651
Fax: +255 22 2781472 / 2781204
Email: info@aar.co.tz

Profoma Invoice

GLOBAL ANIMAL HEALTH TANZANIA P.O BOX DAR ES SALAAM TANZANIA TIN NO VRN NO	DOCUMENT NO: AIT/ 159INV-0319 PO NUMBER DATE: 2019-06-21
AAR TIN NO: 105-677-647	Deliver To : GLOBAL ANIMAL HEALTH TANZANIA P.O BOX DAR ES SALAAM

Description : Comments				Amount
Card Membership Bronze Renewa	Lives 25			22,725,629.00
As per attached list				
Date From : 2019-06-22	Date To : 2020-06-21			
Due date	Amount Due	Disc Amount	Disc Date	
2019-06-21	22,725,629.00	0.00	2019-06-21	

PLEASE INDICATE THE DOCUMENT NUMBER IN THE PAYMENT

1. Bankers	2. Bankers: USD		
Citibank Tanzania Ltd	KCB Bank Tanzania Limited		
Dar-es-salaam Branch	Oyster Bay Branch		
Tshs Account No: (b)(4)	Tshs Account No: (b)(4)		
US$ Account No:	US$ Account No:		
Swift Code: CITITZTZ	Swift Code: KCBLTZTZ		
Branch Code: 070631	Branch Code: 671711		

TZS	
Subtotal before taxes	22,725,629.00
Total taxes	0.00
Total amount	22,725,629.00
Discount taken	0.00
Credit amount	0.00
Amount due	22,725,629.00

Signed by..... Date.....

For: **AAR INSURANCE TANZANIA LIMITED**

As per Insurance Act 2009, Insurance Premium must be paid before inception/renewal of the policy
All premium payment must be done through the bank, AAR will not be responsive for any payment made to any individual or office.

USD TO TZS EXCHANGE RATE AS OF 21 October 2019 — 2,289.52

Payroll - Global Animal Health — OCTOBER 2019

No	Employee name	Basic	Salary Arrears	Gross salary	NSSF	Taxable pay	PAYE	HESLB	Net pay	SDL (4.5%)	WCF (1%)	Employer cost per staff
[illegible]	[illegible]	1,000,000	-	1,000,000	100,000.00	900,000	153,421		750,983	45,000	10,000	1,155,000
[illegible]	[illegible]	1,429,151	-	1,429,151	142,915.10	1,286,236	367,987		1,018,249	64,311	14,292	1,650,607
[illegible]	[illegible]	1,560,849	-	1,560,849	156,084.90	1,404,764	402,324		1,098,429	70,238	15,608	1,797,038
[illegible]	[illegible]	1,819,765	-	1,819,765	181,976.50	1,637,789	471,760		1,286,196	81,889	18,198	2,101,852
[illegible]	[illegible]	4,055,784	-	4,055,784	405,578.40	3,650,215	997,104	614,369	2,083,882	182,513	40,558	4,733,642
[illegible]	[illegible]	1,108,482	-	1,108,482	110,848.21	997,634	264,299		733,044	49,867	11,085	1,281,447
[illegible]	[illegible]	8,760,000	-	8,760,000	876,000.00	7,884,000	1,849,801		6,034,199	394,200	87,600	9,995,110
		20,865,825	-	20,865,825	2,086,584	18,779,243	4,808,473	614,369	13,356,401	938,962	208,658	24,100,078

Summary Payroll 2019

	TZS	USD
Net salary	13,356,401	5,834
PAYE	4,808,473	2,100
SDL (4.5%)	938,962	410
WCF (1%)	208,658	91
HESLB(15%)	614,369	268
TOTAL	24,100,078	10,526

GLOBAL ANIMAL HEALTH TANZANIA ★ P.O.BOX 14413 ARUSHA

LOGICAL PRESENTATION OF REQUIREMENTS FOR APPLICATION OF RESEARCH CLEARANCE AND PERMIT AT COSTECH

The objective of the analysis that led to this presentation was to find a much more easier to understand presentation of the requirements to the prospective applicants.

GENERAL REQUIREMENTS: These apply to all applications

	Item	**Foreigners Affiliated to Local Research and Higher Learning Institutions**	**Others (Tanzanian, Non Tanzanians, affiliated in a foreign country, affiliated locally, etc)**
1	Detailed curriculum vitae	Required for all involved researchers	Required for all involved researchers
2	Full research proposal	Required	Required
3	Sponsor cover letter	Required	Required
4	Support letter from local collaborating institution / contact person	Required	Required
5	Recommendation letter for endorsement of the proposed research within the institution	Required	Not applicable
6	Front-page of passport	Required	Required
7	Proof of payment non-refundable application fees	50 USD	50 USD
8	Application form	Required	Required

REQUIREMENTS FOR SPECIFIC SCENARIOS

a) Research related to medical, public health, drugs, clinical trials, and wildlife issues require special clearance from relevant authorities i.e National Institute of Medical Research (NIMR) for the study that involves medical, public health and / or human subject (health); Tanzania Food and Drug Authority for Clinical Trials; and Tanzania Wildlife Research Institute (TAWIRI) for the study that involves wildlife and natural resources conservation.

b) In case of joining a new researcher to an on-going research which has already been granted a research permit, a Principal Investigator shall submit a request of research permit for a new member to COSTECH at least 2 months prior to his/her joining the research team with detailed curriculum vitae, clear justification and roles for an additional staff / researcher to the on-going project.

c) It is anticipated that the PI will remain responsible for the entire lifetime of the project, unless circumstances necessitate a change of PI. In such rare situation the head of hosting research institution shall write to notify COSTECH within 6 months since termination of outgoing PI. This will be done in writing explaining the reason for the changes and suitability of a newly identified PI. The letter requesting for amendment, accompanied by an up to date progress report shall be subjected to approval process before continuing with the research. It is the responsibility of the hosting institution to submit the request for change of PI within specified time.

POST CLEARANCE

a) After the research has been cleared, the PI will be notified by email. All FOREIGNERS who then wishes to undertake research activities in the country under the cleared research project will be required to apply for permit by presenting a proof of payment of research permit fees (300 USD) and three passport size photos.

b) All researchers granted research permit that involve collecting human, plant or animal materials / data that will be exported outside Tanzania must submit a signed Material Transfer Agreement (MTA) / Data Transfer Agreement (DTA) between Tanzania host institution and the foreign counterpart. The MTA/DTA will indicate terms for collecting, storing/managing, transporting, disposal or returning of the materials/DATA to Tanzania after the closure of the research project.

c) An Applicant who has been permitted to conduct research in Tanzania is obliged to submit soft and **two (2) hard copies** (printed) and soft copy of his/her research report /thesis with COSTECH on completion of research.

d) COSTECH will have an access to data and research premises of the permitted research projects.

e) A Principal Investigator (PI) permitted to conduct research in Tanzania is obliged to submit a quarterly/annually report.

f) Persons who have not submitted satisfactory final reports / thesis on previous research work in Tanzania may not be cleared for new projects. Attention will be drawn to the sponsoring institutions and referees on shared responsibility of making sure that researchers sponsored by them observe the foregoing regulations. A breach of the regulations could result in refusal of permits for other researchers sponsored by same institutions or referees.

g) Any patent or intellectual property and royalty emanating from any research approved by the National Research Registration Committee (NRRC) should be owned by the respective research institutions involved.

T218! 296

The United Republic of Tanzania

MINISTRY OF NATURAL RESOURCES AND TOURISM

Tanzania Wildlife Research Institute - TAWIRI

Government Bill

Control Number:	99433080011101
Service Provider Code:	SP433
Payer Name:	[illegible]
Address:	[illegible]
Phone Number:	[illegible]

General Description

Research Fee for Data Bankester to undertake its research Project Ecosystem Health in Tanzania

Description	Quantity	Unit Price	Amount
Research Fees (Non TZ)	1	1,800.00	1,800.00
Critical Protected Area Fees (Non TZ)	1	2,000.00	2,000.00

Total: 3,800.00 USD

Amount in Words: Three Thousand Eight Hundred

Issued On:	[illegible]
Expires On:	[illegible]
Payment Mode:	[illegible]
Payment For:	[illegible]
Signature:	

Just via Kulipa

How to Pay

[illegible] Payment Reference Number: 99433080011101

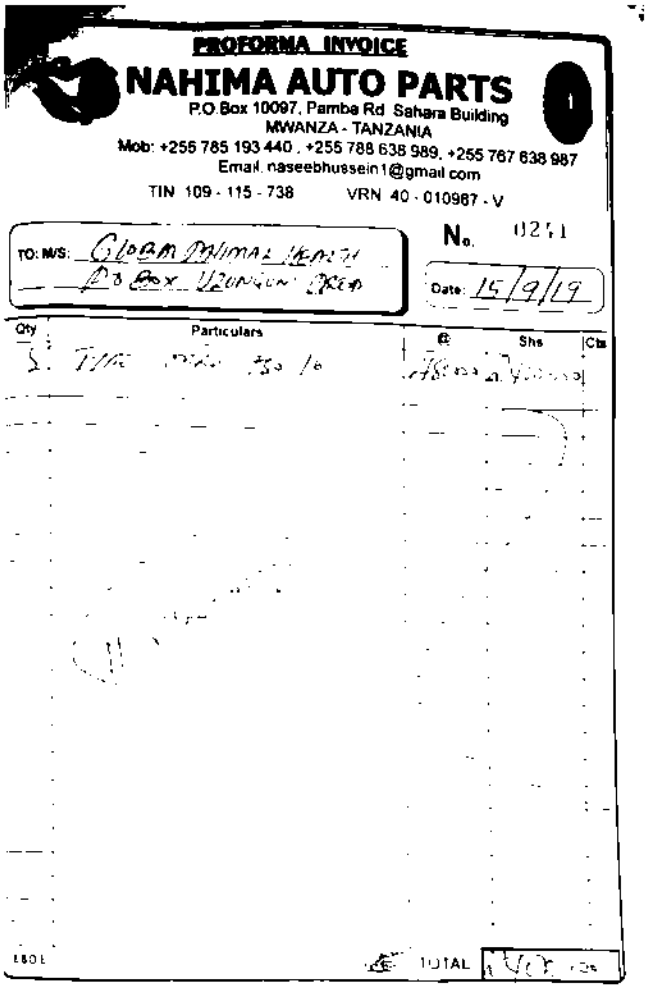
[illegible] Payment Reference Number: 99433080011101

- [illegible]
- [illegible]
- [illegible]
- [illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]

Average Annual Maintenance Costs for a vehicle.

Tyre changing every after 15,000km estimated 3 times a year. 5 tyres each TZS 480,000 ($210)



PROFORMA INVOICE

NAHIMA AUTO PARTS

P.O Box 10097, Pamba Rd Sahara Building
MWANZA - TANZANIA
Mob: +255 785 193 440 , +255 788 638 989, +255 767 638 987
Email. naseebhussein1@gmail com
TIN 109 - 115 - 738 VRN 40 - 010987 - V

TO: M/S: Gloam NAHIMA HEALTH
P.O Box UZUNGUNI AREA

No. 0251

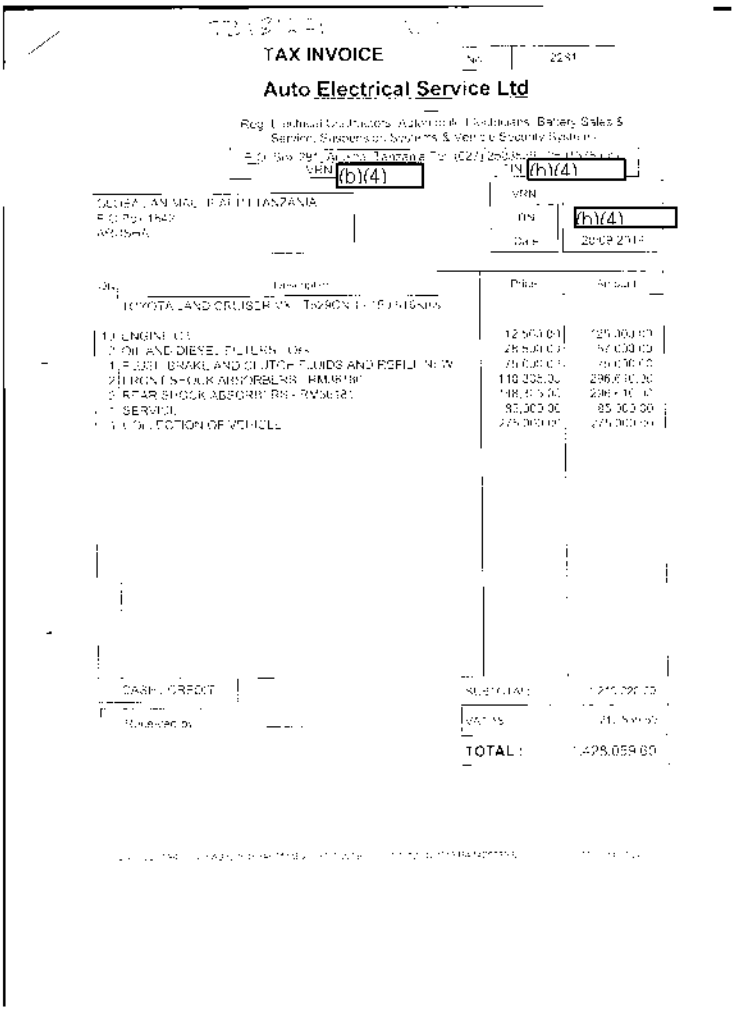
Date: 15/9/19

Qty	Particulars	@	Shs	Cts
5	Tire [illegible] 750 16	[illegible]	[illegible]	

E&OE

TOTAL [illegible]

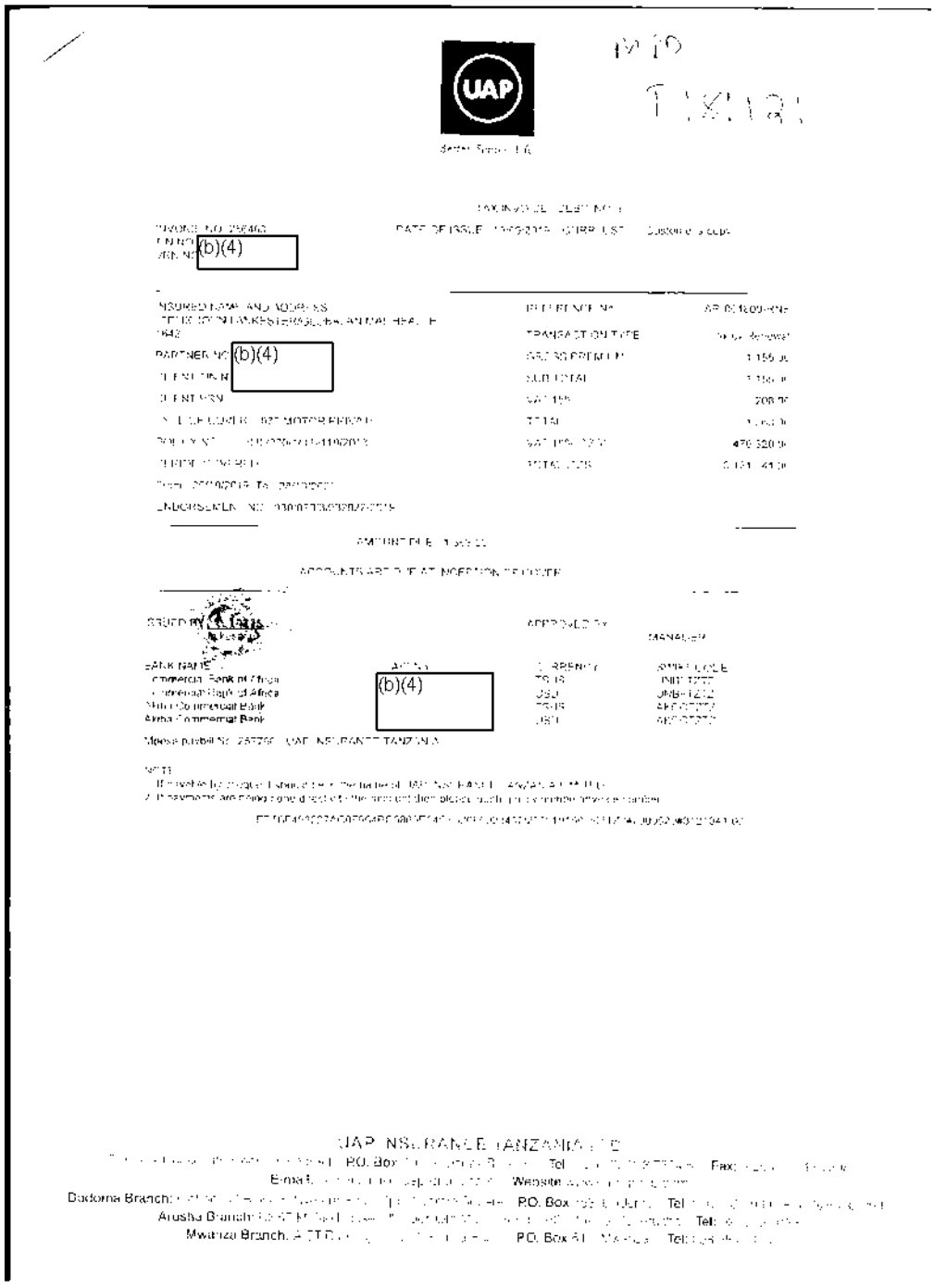
Routine Maintenance (replacement of; bush, fuel filter, air filter, shock absorbers, brake pads, and engine oil changing, etc) every after 5,000 km estimated each TZS 1,428,059.60 ($624)



TAX INVOICE

Auto Electrical Service Ltd

TOTAL : 1,428,059.60


(b)(4)

Vehicle insurance: Tsh 3,121,041 / 2,289.52 = $1,363

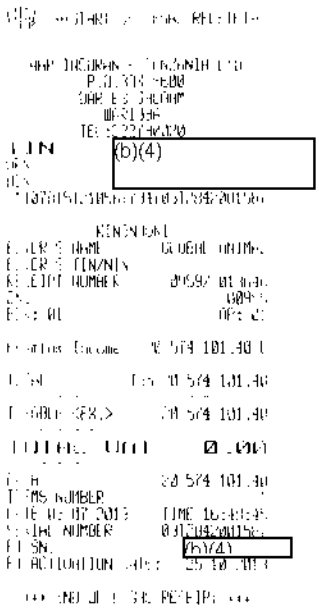
UAP Insurance Tanzania Ltd

RECEIPT

Payment receipt number:	ARR000001837 8/7/2019
On behalf of	GLOBAL ANIMA HEALTH TANZANIA
Currency	Tanzanian Shilling
Amount	3,131,541.00
Amount in words	THREE MILLION ONE HUNDRED THIRTY ONE THOUSAND FORTY ONE ONLY
Method of payment	Cash Cheq
Cheque number	LPO
Bankers	
Credit to	
Agent/Broker code	
Agent/Broker name	JARDINE & CO TANZANIA LIMITED
Type of payment	GLOBAL ANIMAL HEALTH
Policy number	TBA
Claim number	
Branch code	

Note: The receipt is subject to the realization of the amount stipulated

Issued by: Bakari Ahumani Signed:

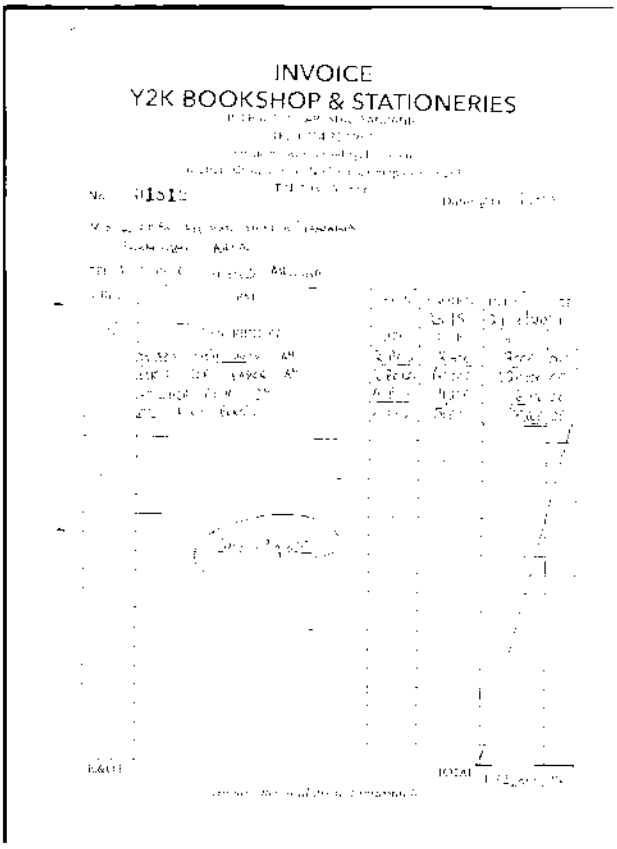


OFFICE SUPPLIES

The list of office supplies is not exhaustive and we do not have recent comprehensive list yet. Several items were purchased a couple of days ago as seen in the documents below. Note that similar purchase can occur throughout the year USD 2,000. Below is the likely list of supplies and receipt for some of items that we purchased.

LIST OF COMMON OFFICE SUPPLIES 0.00043 Ex rate oanda.com 11/5

Item	Average Price, TZS	USD Equivalent	Item	Average Price, TZS	USD Equivalent
A4 Printer paper	60,000.00	25.80	Hole puncher		-
Spiral bound notebooks - L	13,500.00	5.81	Legal pads	5,000.00	2.15
Box files	5,000.00	2.15	Manila folders	4,000.00	1.72
Stappler	7,500.00	3.23	Hanging folders	4,000.00	1.72
Punching machine	6,000.00	2.58	Paper clips	4,500.00	1.94
Pen	5,000.00	2.15	Binder clips	12,000.00	5.16
Pencils	2,500.00	1.08	Masking Tape	3,500.00	1.51
Highlighters	4,500.00	1.94	Packing Tape	4,500.00	1.94
Glue	6,000.00	2.58	White glue	6,500.00	2.80
Scissors	5,500.00	2.37	Pencil sharpner	2,500.00	1.08
Ruler	1,200.00	0.52	Erasers	1,500.00	0.65
Staplepins	3,500.00	1.51	Ink pad	3,500.00	1.51
Sticker notes	4,000.00	1.72	Correction fluid	2,500.00	1.08
Writing pads	6,000.00	2.58	Garbage bags	12,000.00	5.16
Electric extension cables	35,000.00	15.05	Broom	6,000.00	2.58
Dust bins	8,500.00	3.66	Dustpan	7,000.00	3.01
Office tray	25,000.00	10.75	Disinfectants	40,000.00	17.20
Paper shreader	320,000.00	137.60	Window cleaner	12,000.00	5.16
Notice board	70,000.00	30.10	Water dispenser refills	5,000.00	2.15
Cartilage	350,000.00	150.50	Coffee	12,000.00	5.16
Envelops	6,000.00	2.58			
Counter books	4,200.00	1.81			
Spiral note books - S	3,500.00	1.51			



INVOICE

Y2K BOOKSHOP & STATIONERIES

(b)(4)

(b)(4)

INVOICE

WSU budget documentation

KILIMANJARO CHRISTIAN MEDICAL CENTRE

Kilimanjaro Christian Medical Centre
An Institution of the Good Samaritan Foundation
P.O. Box 3010, Moshi, Tanzania
Telephone: 255 27 2754377/83// Fax: 255 27 2754381
Email: kcmcadmin@kcmc.ac.tz
Website: http://www.kcmc.ac.tz

Customer
Name: Global Animal
Address: Health Tanzania.
City/Town:
Tel:
TIN:
VRN:

Date: 21/11/2019.

No: 0069

S/NO	Qty	Particulars	PRICE	Amount
		Annual Disposal		USD 525=
		fee		
		US Dollar Five		
		Hundred twenty		
		five only.		
	Deposit Account No			
	Account Name: DIRECTOR ICCMC			
	Account Number: (b)(4)			
	Bank Name: NATIONAL BANK OF COMMERCE			
	(NBC)			
	Branch Name: MOSHI BRANCH			
	SWIFT CODE: (b)(4)			
	Branch Code: 017.			
		SUB TOTAL		
		OTHER CHARGES		
		TOTAL		USD 525=

WASHINGTON STATE UNIVERSITY

WSU CONTRACT ##### DRAFT1

CONTRACT FOR PERSONAL SERVICES
BETWEEN

WASHINGTON STATE UNIVERSITY
AND

This contract is made and entered into by and between the state of Washington, **Washington State University**, hereinafter referred to as the "**UNIVERSITY**", and the below named firm or individual, hereinafter referred to as "**CONTRACTOR.**"

NAME
ADDRESS
CITY STATE AND ZIP
TELEPHONE
EMAIL
FEDERAL ID NO.
WASHINGTON STATE UBI NO
WSU VENDOR NO.
STATE OF WA OMWBE CERTIFICATION NO.

1. PURPOSE

The purpose of this Contract is to provide expertise for a federally funded project entitled, "Crimean Congo Hemorrhagic Fever: Reducing an emerging health threat in Tanzania," University lead investigator Dr. Felix Lankester. CONTRACTOR will serve as the project mammologist.

2. SCOPE OF WORK

A. The CONTRACTOR will provide services, and otherwise do all things necessary for or incidental to the performance of work, as set forth below:

1. Assist field teams with the live trapping, sample collection and identification of small mammal species
2. Ensure proper documentation of the species identified
3. Write bi-monthly reports and submit to the University lead investigator, which will include a summary of field activities
4. Attend study meetings as requested and report on progress of work

B. Exhibits A and B contain the General Terms and Conditions governing work to be performed under this contract, the nature of the working relationship between the UNIVERSITY and the CONTRACTOR, and specific obligations of both parties.

C. The CONTRACTOR shall produce the following deliverables by the dates indicated in the chart below:

DATE	DESCRIPTION OF DELIVERABLE ITEM
	• A schedule of travel to be undertaken with field teams to conduct sampling activities and species identification of small mammals • Bi-monthly reports of field activities and species identification • Attendance at study related meetings as requested

3. PERIOD OF PERFORMANCE

The period of performance under this contract will be from xxxx through xxxx.

The execution of this Contract shall constitute a ratification of that earlier verbal agreement between the parties, the terms and conditions of which are contained herein. Accordingly, the beginning date of performance under this Contract shall be xxxx regardless of the date of execution. UNIVERSITY shall reimburse the CONTRACTOR for those costs incurred in performance hereunder, for that period between the beginning date of performance and the date of execution of this Contract.

4. COMPENSATION AND PAYMENT

All compensation amounts and funds due to CONTRACTOR are stated in U.S. Dollars (USD Payments will be made in Tanzania Shilling by UNIVERSITY'S Local Affiliate, PFK Limited and non-government agency, Global Animal Health Tanzania (GAHT). UNIVERSITY and GAHT will not compensate CONTRACTOR for currency exchange fluctuations through the issuance of payment.

Payments to CONTRACTOR will be subjected to all Tanzanian tax regulation.

UNIVERSITY shall pay **an amount not to exceed $12,000.00** for the performance of all things necessary for or incidental to the performance of work as set forth in the Scope of Work. CONTRACTOR'S compensation for services rendered shall be based on the following rates or in accordance with the following terms:

A. **Fees:** At the rate of **$500.00** per month an amount not to exceed **$6,000.00 per year**; which amount is included in the not-to-exceed compensation amount.

B. **Expenses:** The UNIVERSITY shall provide coverage of travel expenses related to official work that has been approved in advance by the Project Manager, including:

1. Lodging and subsistence necessary during periods of required travel.

5. BILLING PROCEDURES

UNIVERSITY will pay CONTRACTOR upon receipt of properly completed invoices, which may be submitted to the Contract Manager via email. The billing address for invoices is:

Washington State University
Controllers Office
Attn: WSU Contract XXXX~ Rebecca Manning, Mail Code 7090
P.O. Box 641025
Pullman, WA 99164-1025

The invoices shall describe and document to the UNIVERSITY'S satisfaction a description of the work performed, the progress of the project, and fees. If expenses are invoiced, provide a detailed breakdown of each type. Any single expense in the amount of $50.00 or more must be accompanied by a receipt in order to receive reimbursement.

Payment shall be considered timely if made by the UNIVERSITY within thirty (30) days after receipt of properly completed invoices. Payment shall be sent to the address designated by the CONTRACTOR.

The UNIVERSITY may, in its sole discretion, terminate the contract or withhold payments claimed by the CONTRACTOR for services rendered if the CONTRACTOR fails to satisfactorily comply with any term or condition of this contract.

No payments in advance or in anticipation of services or supplies to be provided under this contract shall be made by the UNIVERSITY.

6. CONTRACT MANAGEMENT

A. The Contract Manager for each of the parties shall be the contact person for all communications regarding the performance of this contract and billing.

	CONTRACT MANAGER FOR THE CONTRACTOR	CONTRACT MANAGER FOR THE UNIVERSITY
NAME		Rebecca Manning
ADDRESS		Paul G. Allen School for Global Animal Health P.O. Box 647090
ADDRESS		Pullman, WA 99164-7090
TELEPHONE		509-335-5861
EMAIL		manningr@wsu.edu
		DES Training Completed? yes no

B. The Project Manager for each of the parties will be point of contact for scope of work. Project Manager for UNIVERSITY will receive and accept deliverables and determine if CONTRACTOR has satisfactorily completed the scope of work.

	PROJECT MANAGER FOR THE CONTRACTOR	PROJECT MANAGER FOR THE UNIVERSITY
NAME		Dr. Felix Lankester
ADDRESS		P. O. Box 647090
ADDRESS		Pullman, WA 99164-7090
TELEPHONE		+44 7426 426831
EMAIL		Felix.lankester@wsu.edu

7. INSURANCE

The CONTRACTOR shall insure themselves and any persons working for their organization; and they shall be exclusively liable for any claims arising from them and/or their employees, from performance of their obligations of this Contract.

CONTRACTOR shall submit to UNIVERSITY within 15 days of the Contract effective date, a certificate of insurance that outlines the coverage and limits defined in the Insurance section. The mailing address for certificate holder is:

Washington State University
Contract #####
PO Box 641020
Pullman, WA 99164-1020

8. ASSURANCES

UNIVERSITY and the CONTRACTOR agree that all activity pursuant to this contract will be in accordance with all the applicable current federal, state and local laws, rules, and regulations.

9. ORDER OF PRECEDENCE

Each of the Exhibits listed below is by this reference hereby incorporated into this contract. In the event of an inconsistency in this contract, the inconsistency shall be resolved by giving precedence in the following order:

1. Applicable Federal and state of Washington statutes and regulations
2. Special Terms and Conditions as contained in this basic contract instrument
3. Exhibit B – FAR Terms and Conditions (for Federal Grant Funded Purchases only)
4. Exhibit A UNIVERSITY General Terms and Conditions
5. Any other provision, term or material incorporated herein by reference or otherwise incorporated.

10. ENTIRE AGREEMENT

This contract including referenced exhibits represents all the terms and conditions agreed upon by the parties. No other statements or representations, written or oral, shall be deemed a part hereof.

11. CONFORMANCE

If any provision of this contract violates any statute or rule of law of the state of Washington, it is considered modified to conform to that statute or rule of law.

12. APPROVAL

This contract shall be subject to the written approval of the UNIVERSITY'S authorized representative and shall not be binding until so approved. The contract may be altered, amended, or waived only by a written amendment executed by both parties.

This CONTRACT, consisting of FOUR pages and two attachments named Exhibit A and Exhibit B, is executed by the persons signing below who warrant that they have the authority to execute the agreement.

TYPE CONTRACTOR NAME HERE		**WASHINGTON STATE UNIVERSITY**	
Signature	Date	Patty Gropp, C.P.M	Date
Name of signatory		Associate Director, Purchasing	
Title of signatory			
Email address of signatory			

WSU Contract XXXX
Exhibit A

GENERAL TERMS AND CONDITIONS FOR PERSONAL SERVICES CONTRACT

DEFINITIONS
As used throughout this CONTRACT, the following terms shall have the meaning set forth below:

A. "UNIVERSITY" shall mean Washington State University, an institution of higher education of the State of Washington, any division, section, office, unit or other entity of the UNIVERSITY, or any of the officers or other officials lawfully representing that UNIVERSITY.

B. "AGENT" shall mean the delegated individual authorized in writing to act on the UNIVERSITY'S behalf.

C. "CONTRACTOR" shall mean that firm, provider, organization, individual or other entity performing service(s) under this contract, and shall include all employees of the CONTRACTOR.

D. "SUBCONTRACTOR" shall mean one not in the employment of the CONTRACTOR, who is performing all or part of those services under this contract under a separate contract with the CONTRACTOR. The terms "SUBCONTRACTOR" and "SUBCONTRACTORS" means SUBCONTRACTOR(s) in any tier.

ACCESS TO DATA
In compliance with RCW 39.26.180, the CONTRACTOR shall provide access to data generated under this contract to UNIVERSITY, the Joint Legislative Audit and Review Committee, and the State Auditor at no additional cost. This includes access to all information that supports the findings, conclusions, and recommendations of the CONTRACTOR'S reports, including computer models and methodology for those models.

ADVANCE PAYMENTS PROHIBITED
In accordance with state law, no payments in advance of or in anticipation of goods or services to be provided under this CONTRACT shall be made by the UNIVERSITY.

AMENDMENTS
This CONTRACT may be amended by mutual agreement of the parties. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the parties.

ASSIGNMENT
Neither this contract, nor any claim arising under this contract, shall be transferred or assigned by the CONTRACTOR without prior written consent of the UNIVERSITY.

ATTORNEYS' FEES
In the event of litigation or other action brought to enforce contract terms, each party agrees to bear its own attorney fees and costs.

CONFIDENTIALITY/SAFEGUARDING OF INFORMATION
The CONTRACTOR shall not use or disclose any information concerning the UNIVERSITY, or information that may be classified as confidential, for any purpose not directly connected with the administration of this contract, except with prior written consent of the UNIVERSITY, or as may be required by law.

CONFLICT OF INTEREST
Notwithstanding any determination by the Executive Ethics Board or other tribunal, the UNIVERSITY may, in its sole discretion, by written notice to the CONTRACTOR terminate this contract if it is found after due notice and examination by the UNIVERSITY that there is a violation of the Ethics in Public Service Act, Chapter 42.52 RCW; or any similar statute involving the CONTRACTOR in the procurement of, or performance under this contract.

In the event this contract is terminated as provided above, the UNIVERSITY shall be entitled to pursue the same remedies against the CONTRACTOR as it could pursue in the event of a breach of the contract by the CONTRACTOR. The rights and remedies of the UNIVERSITY provided for in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law. The existence of facts upon which the AGENT makes any determination under this clause shall be an issue and may be reviewed as provided in the "Disputes" clause of this contract.

COPYRIGHT PROVISIONS
Unless otherwise provided, all materials produced under this contract shall be considered "works for hire" as defined by the U.S. Copyright Act and shall be owned by the UNIVERSITY. The UNIVERSITY shall be considered the author of such materials. In the event the materials are not considered "works for hire" under the U.S. Copyright laws, CONTRACTOR hereby irrevocably assigns all right, title, and interest in materials, including all intellectual property rights, to the UNIVERSITY effective from the moment of creation of such materials.

Materials means all items in any format and includes, but is not limited to, data, reports, documents, pamphlets, advertisements, books, magazines, surveys, studies, computer programs, films, tapes, and/or sound reproductions. Ownership includes the right to copyright, patent, register and the ability to transfer these rights.

For materials that are delivered under the contract, but that incorporate pre-existing materials not produced under the contract, CONTRACTOR hereby grants to the UNIVERSITY a nonexclusive, royalty-free, irrevocable license (with rights to sublicense others) in such materials to translate, reproduce, distribute, prepare derivative works, publicly perform, and publicly display. The CONTRACTOR warrants and represents that CONTRACTOR has all rights and permissions, including intellectual property rights, moral rights and rights of publicity, necessary to grant such a license to the UNIVERSITY.

The CONTRACTOR shall exert all reasonable effort to advise the UNIVERSITY, at the time of delivery of materials furnished under this contract, of all known or potential invasions of privacy contained therein and of any portion of such document that was not produced in the performance of this contract.

The UNIVERSITY shall receive prompt written notice of each notice or claim of infringement received by the CONTRACTOR with respect to any data delivered under this contract. The UNIVERSITY shall have the right to modify or remove any restrictive markings placed upon the data by the CONTRACTOR.

COVENANT AGAINST CONTINGENT FEES
The CONTRACTOR warrants that no person or selling agent has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, excepting bona fide employees or bona fide established agents maintained by the CONTRACTOR for securing business.

The UNIVERSITY shall have the right, in the event of breach of this clause by the CONTRACTOR, to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration or recover by other means the full amount of such commission, percentage, brokerage or contingent fee.

DISALLOWED COSTS
The Contractor is responsible for any audit exceptions or costs disallowed by the UNIVERSITY that are incurred by the Contractor or its Subcontractors.

DISPUTES
In the event that a dispute arises under this Contract that the parties can't resolve, they shall allow the dispute to be decided by a Dispute Panel in the following manner: each party to this Contract shall appoint one member to the Dispute Panel, and the members so appointed shall jointly appoint an additional member to the Dispute Panel. The Dispute Panel shall review the facts, contract terms and applicable statutes and rules and make a determination of the dispute. The determination of the Dispute Panel shall be final and binding on the parties hereto. The parties shall equally share the costs, if any, for the services of the Dispute Panel.

Nothing in this contract shall be construed to limit the parties' choice of a mutually acceptable alternate dispute resolution method in addition to the dispute resolution procedure outlined above.

DUPLICATE PAYMENT
The UNIVERSITY shall not pay the CONTRACTOR, if the CONTRACTOR has charged or will charge Washington State University, the State of Washington or any other party under any other contract or agreement, for the same services or expenses.

FUNDING CONTINGENCY
In the event funding from state, federal, or other sources is withdrawn, reduced, or limited in any way after the effective date of this contract and prior to normal completion, the UNIVERSITY may terminate the contract under the "Termination for Convenience" clause, without the ten-day notice requirement, subject to renegotiation at the UNIVERSITY'S discretion under those new funding limitations and conditions.

GOVERNING LAW
This contract shall be construed and interpreted in accordance with the laws of the State of Washington, and the venue of any action brought hereunder shall be in the Superior Court for Whitman County.

INDEMNIFICATION
To the fullest extent permitted by law, CONTRACTOR shall indemnify, defend, and hold harmless Washington State University, the State of Washington, agencies of the State and all officials, agents and employees of the State, from and against all claims for injuries or death arising out of or resulting from the performance of the contract. "Claim," as used in this contract, means any financial loss, claim, suit, action, damage, or expense, including but not limited to attorney's fees, attributable for bodily injury, sickness, disease, or death, or injury to or destruction of tangible property including loss of use resulting therefrom.

CONTRACTOR'S obligations to indemnify, defend, and hold harmless includes any claim by CONTRACTORS' agents, employees, representatives, or any subcontractor or its employees.

CONTRACTOR expressly agrees to indemnify, defend, and hold harmless Washington State University and the State of Washington for any claim arising out of or incident to CONTRACTOR'S or any subcontractor's performance or failure to perform the contract. CONTRACTOR'S obligation to indemnify, defend, and hold harmless Washington State University and the State of Washington shall not be eliminated or reduced by any actual or alleged concurrent negligence of State or its agents, agencies, employees and officials.

CONTRACTOR waives its immunity under Title 51 RCW to the extent it is required to indemnify, defend and hold harmless Washington State University and the State of Washington and its agencies, officials, agents or employees.

INDEPENDENT CAPACITY OF THE CONTRACTOR
The parties intend that an independent contractor relationship will be created by this contract. The CONTRACTOR and his or her employees or agents performing under this contract are not employees or agents of the UNIVERSITY. The CONTRACTOR will not hold himself/herself out as or claim to be an officer or employee of the UNIVERSITY or of the State of Washington by reason hereof, nor will the CONTRACTOR make any claim of right, privilege or benefit that would accrue to such employee under law. Conduct and control of the work will be solely with the CONTRACTOR.

INDUSTRIAL INSURANCE COVERAGE
The CONTRACTOR shall comply with the provisions of Title 51 RCW, Industrial Insurance. If the CONTRACTOR fails to provide industrial insurance coverage or fails to pay premiums or penalties on behalf of its employees, as may be required by law, UNIVERSITY may collect from the CONTRACTOR the full amount payable to the Industrial Insurance accident fund. The UNIVERSITY may deduct the amount owed by the CONTRACTOR to the accident fund from the amount payable to the CONTRACTOR by the UNIVERSITY under this contract, and transmit the deducted amount to the Department of Labor and Industries, (L&I) Division of Insurance Services. This provision does not waive any of L&I's rights to collect from the CONTRACTOR.

LICENSING, ACCREDITATION AND REGISTRATION
The CONTRACTOR shall comply with all applicable local, state, and federal licensing, accreditation and registration requirements/standards, necessary for the performance of this contract.

LIMITATION OF AUTHORITY
Only a WSU UNIVERSITY'S personnel authorized in writing to bind UNIVERSITY (delegation to be made prior to action) shall have the express, implied, or apparent authority to alter, amend, modify, or waive any clause or condition of this contract. Any alterations, amendment, modifications, or waivers made by UNIVERSITY personnel or employees without such written authority will not be effective or binding unless also made in writing and signed by an authorized UNIVERSITY representative.

NONDISCRIMINATION
During the performance of this contract, the CONTRACTOR shall comply with all federal and state nondiscrimination laws, regulations and policies, including the AMERICANS WITH DISABILITIES ACT (ADA) OF 1990, PUBLIC LAW 101-336, also referred to as the "ADA" 28 CFR Part 35.

In the event of the CONTRACTOR'S non-compliance or refusal to comply with any nondiscrimination law, regulation, or policy, this contract may be rescinded, canceled or terminated in whole or in part, and the CONTRACTOR may be declared ineligible for further contracts with the UNIVERSITY. The CONTRACTOR shall, however, be given a reasonable time in which to cure this noncompliance. Any dispute may be resolved in accordance with the "Disputes" procedure set forth herein.

PRIVACY
Personal information including, but not limited to, "Protected Health Information," collected, used, or acquired in connection with this contract shall be protected against unauthorized use, disclosure, modification or loss. CONTRACTOR shall ensure its directors, officers, employees, subcontractors or agents use personal information solely for the purposes of accomplishing the services set forth herein. CONTRACTOR and its subcontractors agree not to release, divulge, publish, transfer, sell or otherwise make known to unauthorized persons personal information without the express written consent of the UNIVERSITY or as otherwise required by law.

Any breach of this provision may result in termination of the contract and the demand for return of all personal information. The CONTRACTOR agrees to indemnify and hold harmless the UNIVERSITY for any damages related to the CONTRACTOR'S unauthorized use of personal information.

PUBLICITY
The CONTRACTOR agrees to submit to the UNIVERSITY all advertising and publicity matters relating to this contract wherein the UNIVERSITY'S name is mentioned or language used from which the connection of the UNIVERSITY'S name may, in the UNIVERSITY'S judgment, be inferred or implied. The CONTRACTOR agrees not to publish or use such advertising and publicity matters without the prior written consent of the UNIVERSITY.

RECORDS MAINTENANCE
The CONTRACTOR shall maintain books, records, documents, data and other evidence relating to this contract and performance of the services described herein, including but not limited to accounting procedures and practices that sufficiently and properly reflect all direct and indirect costs of any nature expended in the performance of this contract.

CONTRACTOR shall retain such records for a period of six years following the date of final payment. At no additional cost, these records, including materials generated under the contract, shall be subject at all reasonable times to inspection, review or audit by the UNIVERSITY, personnel duly authorized by the UNIVERSITY, the Office of the State Auditor, and federal and state officials so authorized by law, regulation or agreement.

If any litigation, claim or audit is started before the expiration of the six (6) year period, the records shall be retained until all litigation, claims, or audit findings involving the records have been resolved.

REGISTRATION WITH DEPARTMENT OF REVENUE
If required to do so by law, the CONTRACTOR shall complete registration with the Washington State Department of Revenue and be responsible for payment of all taxes due on payments made under this contract.

RIGHT OF INSPECTION
The CONTRACTOR shall provide right of access to its facilities to the UNIVERSITY, or any of its officers, or to any other authorized agent or official of the state of Washington or the federal government, at all reasonable times, in order to monitor and evaluate performance, compliance, and/or quality assurance under this contract.

SEVERABILITY
The provisions of this contract are intended to be severable. If any term or provision is illegal or invalid for any reason whatsoever, such illegality or invalidity shall not affect the validity of the remainder of the contract.

SITE SECURITY
While on UNIVERSITY premises, CONTRACTOR, its agents, employees, or subcontractors shall conform in all respects with UNIVERSITY'S physical, fire or other security policies or regulations.

SUBCONTRACTING
Neither the CONTRACTOR nor any approved SUBCONTRACTOR shall enter into subcontracts for any of the work contemplated under this Contract without obtaining prior written approval of the UNIVERSITY. In no event shall the existence of the subcontract operate to release or reduce the liability of the CONTRACTOR to the UNIVERSITY for any breach in the performance of the CONTRACTOR's duties. This clause does not include contracts of employment between the contractor and personnel assigned to work under this contract.

Additionally, the CONTRACTOR is responsible for ensuring that all terms, conditions, assurances and certifications set forth in this CONTRACT are carried forward to any subcontracts. CONTRACTOR and its subcontractors agree not to release, divulge, publish, transfer, sell or otherwise make known to unauthorized persons personal information without the express written consent of the UNIVERSITY or as provided by law.

TAXES
All payments accrued because of payroll taxes, unemployment contributions, any other related taxes, insurance or other expenses for the CONTRACTOR or its staff shall be the sole responsibility of the CONTRACTOR.

TERMINATION FOR CAUSE
In the event the UNIVERSITY determines the CONTRACTOR has failed to comply with the conditions of this contract in a timely manner, the UNIVERSITY has the right to suspend or terminate this contract. Before suspending or terminating the contract, the UNIVERSITY shall notify the CONTRACTOR in writing of the need to take corrective action. If corrective action is not taken within 30 calendar days of date of notice, the contract may be terminated or suspended.

In the event of termination or suspension, the CONTRACTOR shall be liable for damages as authorized by law including, but not limited to, any cost difference between the original contract and the replacement or cover contract and all administrative costs directly related to the replacement contract, e.g., cost of the competitive bidding, mailing, advertising and staff time.

The UNIVERSITY reserves the right to suspend all or part of the contract, withhold further payments, or prohibit the CONTRACTOR from incurring additional obligations of funds during investigation of the alleged compliance breach and pending corrective action by the CONTRACTOR or a decision by the UNIVERSITY to terminate the contract. A termination shall be deemed a "Termination for Convenience" if it is determined that the CONTRACTOR: (1) was not in default; or (2) failure to perform was outside of his or her control, fault or negligence.

The rights and remedies of the UNIVERSITY provided in this contract are not exclusive and are, in addition to any other rights and remedies, provided by law.

TERMINATION FOR CONVENIENCE
Except as otherwise provided in this Contract, the UNIVERSITY may, by 30 calendar days written notice terminate this Contract, in whole or in part. If this Contract is so terminated, the UNIVERSITY shall be liable only for payment required under the terms of this contract for services rendered or goods delivered prior to the effective date of termination.

TERMINATION PROCEDURES
Upon termination of this CONTRACT, the UNIVERSITY, in addition to any other rights provided in this CONTRACT, may require the CONTRACTOR to deliver to the UNIVERSITY any property specifically produced or acquired for the performance of such part of this contract as has been terminated. The provisions of the "Treatment of Assets" clause shall apply in such property transfer.

The UNIVERSITY shall pay to the CONTRACTOR the agreed upon price, if separately stated, for completed work and services accepted by the UNIVERSITY, and the amount agreed upon by the CONTRACTOR and the UNIVERSITY for (i) completed work and services for which no separate price is stated, (ii) partially completed work and services, (iii) other property or services that are accepted by the UNIVERSITY, and (iv) the protection and preservation of property, unless the termination is for default, in which case the AGENT shall determine the extent of the liability of the UNIVERSITY. Failure to agree with such determination shall be a dispute within the meaning of the "Disputes" clause of this contract. The UNIVERSITY may, in good faith, withhold from any amounts due the CONTRACTOR such sum as the AGENT determines to be necessary to protect the UNIVERSITY against potential loss or liability.

The rights and remedies of the UNIVERSITY provided in this section shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

After receipt of a notice of termination, and except as otherwise directed by the UNIVERSITY, the CONTRACTOR shall:

1. Stop work under the contract on the date, and to the extent specified, in the notice;
2. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the work under the contract that is not terminated;
3. Assign to the UNIVERSITY, in the manner, at the times, and to the extent directed by the UNIVERSITY, all of the rights, title, and interest of the CONTRACTOR under the orders and subcontracts so terminated, in which case the UNIVERSITY has the right, at its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
4. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the UNIVERSITY to the extent UNIVERSITY may require, which approval or ratification shall be final for all the purposes of this clause;
5. Transfer title to the UNIVERSITY and deliver in the manner, at the times, and to the extent directed by the UNIVERSITY any property which, if the contract had been completed, would have been required to be furnished to the UNIVERSITY;
6. Complete performance of such part of the work as shall not have been terminated by the UNIVERSITY; and
7. Take such action as may be necessary, or as the UNIVERSITY may direct, for the protection and preservation of the property related to this contract, which is in the possession of the CONTRACTOR and in which the UNIVERSITY has or may acquire an interest.

TREATMENT OF ASSETS

A. Title to all property furnished by the UNIVERSITY shall remain in the UNIVERSITY. Title to all property furnished by the CONTRACTOR, for the cost of which the CONTRACTOR is entitled to be reimbursed as a direct item of cost under this contract, shall pass to and vest in the UNIVERSITY upon delivery of such property by the CONTRACTOR. Title to other property, the cost of which is reimbursable to the CONTRACTOR under this contract, shall pass to and vest in the UNIVERSITY upon (i) issuance for use of such property in the performance of this contract, or (ii) commencement of use of such property in the performance of this contract, or (iii) reimbursement of the cost thereof by the UNIVERSITY in whole or in part, whichever first occurs.

B. Any property of the UNIVERSITY furnished to the CONTRACTOR shall, unless otherwise provided herein or approved by the UNIVERSITY, be used only for the performance of this contract.

C. The CONTRACTOR shall be responsible for any loss or damage to property of the UNIVERSITY that results from the negligence of the CONTRACTOR or which results from the failure on the part of the CONTRACTOR to maintain and administer that property in accordance with sound management practices.

D. If any UNIVERSITY property is lost, destroyed or damaged, the CONTRACTOR shall immediately notify the UNIVERSITY and shall take all reasonable steps to protect the property from further damage.

E. The CONTRACTOR shall surrender to the UNIVERSITY all property of the UNIVERSITY prior to settlement upon completion, termination or cancellation of this contract

F. All reference to the CONTRACTOR under this clause shall also include CONTRACTOR'S employees, agents or SUBCONTRACTORS.

WAIVER

Waiver of any default or breach shall not be deemed a waiver of any subsequent default or breach. Any waiver shall not be construed to be a modification of the terms of this contract unless stated to be such in writing and signed by authorized representative of the UNIVERSITY.

CONTRACT TERMS AND CONDITIONS FOR FEDERAL GRANT FUNDED PURCHASES

The WASHINGTON STATE UNIVERSITY by and through its Board of Regents has entered into an agreement with the United States of America. This Contract is entered into with the Contractor in furtherance of the performance of the work required by that agreement. When interpreting applicable provisions of 2 CFR Part 200 and its appendices, "Federal Agency" or "Federal Awarding Agency" shall refer to the agency of the United States Government from whom the Washington State University ("WSU") has received grant funds to be expended under this Contract, "Non-Federal Entity" shall refer to the Washington State University, "Contractor" shall refer to the contractor with whom the Washington State University has entered into this contract and "Contract" shall refer to this contract between the Washington State University and Contractor.

By accepting this order or by entering into this Contract, a Contract between the Washington State University and the Contractor is formed. Contractor agrees to furnish the subject matter required by this order or Contract and agrees to all terms and conditions included by Washington State University, including the terms and conditions specified below. Any other applicable provisions of 2 CFR Part 200 are hereby incorporated by reference and shall have full force and effect.

1. **Breach, Default, Termination:** The Washington State University reserves the right to pursue all available legal, administrative, contractual or equitable remedies in the event of Contractor's breach of contract or violation of any term of this contract. The Washington State University shall have the right to terminate this contract for cause, and shall retain all rights and remedies against Contractor. The Washington State University shall also have the right to terminate this Contract for convenience upon thirty (30) days' notice to Contractor. Breach and/or Termination of this Contract shall be addressed in the manner prescribed in the WSU Standards Terms and Conditions.

2. **Equal Employment Opportunity:** Except as otherwise provided in 41 CFR Part 60, all "federally assisted construction contracts," as defined in 41 CFR Part 60-1.3 are subject to the Equal Opportunity clause contained in 41 CFR 60-1.4(b), incorporated by reference. Furthermore, the Equal Opportunity clause contained in 41 CFR 60-1.4(b) applies to all nonexempt subcontracts entered into by Contractor under this Contract, and Contractor agrees to include the Equal Opportunity clause contained in 41 CFR 60-1.4(b) in all nonexempt subcontracts.

3. **Davis-Bacon Act, as amended (40 U.S.C. 3141-3148):** Where applicable, all prime construction contracts in excess of $2,000 shall comply with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the Davis-Bacon Act, contractors must pay wages to laborers and mechanics at a rate not less than prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must pay wages not less than once per week. If the Davis-Bacon Act applies to this Contract award of this Contract is conditioned upon the acceptance of the wage determination. The Washington State University will report all suspected or reported violations of the Davis-Bacon Act to the Federal Awarding Agency.

4. **Copeland "Anti-Kickback" Act (40 U.S.C. 3145):** Where applicable, all prime construction contracts over $2,000 are subject to the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "**Contractors** and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Washington State University will report all suspected or reported violations to the Federal Awarding Agency. The Act provides that each contractor or subrecipient shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The recipient shall report all suspected or reported violations to the Federal awarding agency.

5. **Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708):** Where applicable, all contracts over $100,000 which will involve the use of mechanics or laborers shall comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each Contractor is required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 apply to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

6. **Rights to Inventions Made Under a Contract or Agreement:** For Contracts awarded by the Washington State University under a "funding agreement," as defined in 37 CFR 401.2(a) between a Federal Awarding Agency and the Washington State University, if the Washington State University or Contractor wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under the "funding agreement," the Washington State University or Contractor must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

7. **Clean Air Act (42 U.S.C. 7401-7671q):** For Contracts and subgrants over $150,000, the Washington State University and Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q). The Washington State University shall report violations to the Federal Awarding Agency and the Regional Office of the Environmental Protection Agency (EPA).

8. **Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended:** For Contracts and subgrants over $150,000, the Washington State University and Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). The Washington State University shall report violations to the Federal Awarding Agency and the Regional Office of the Environmental Protection Agency (EPA).

9. **Energy Policy and Conservation Act (42 U.S.C. 6201):** The Contractor shall comply with all mandatory standards and policies relating to energy efficiency contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201).

10. **Debarment and Suspension (Executive Orders** 12549 **and 12689):** The Washington State University's award of this Contract is conditioned upon the Contractor's current and continued eligibility. Contractor is eligible unless Contractor is listed on the government-wide Excluded Parties List System in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR Part 1986 Comp., p. 189) and 12689 (3 CFR Part 1989 Comp., p. 235), "Debarment and Suspension." The Excluded Parties List System in SAM contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549. If a contractor is listed on the Excluded Parties List System in SAM, Contractor shall have the obligation to promptly inform a Washington State University contract manager, and this Contract shall be immediately terminated without liability on the part of the Washington State University or the Federal Awarding Agency.

11. **Byrd Anti-Lobbying Amendment (31 U.S.C. 1352):** For Contracts over $150,000, Contractor warrants it filed the required certification prior to Contract award and payment. Contractor certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Contractor shall require such certification and disclosure from any subcontractors used. Any further subcontractors must certify and disclose to the subcontractor awarding the subcontract. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures under this Contract shall be forwarded up from tier to tier up to the Washington State University.

12. **Solid Waste Disposal Act (42 USC 6901-6992k):** Contractor must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired by the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

December 4, 2019

RE: TRANSLATION SERVICES ESTIMATES

We will be translating the survey tools from English into Swahili and vernacular tribal languages. Translation services will be sourced in Arusha town and are estimated at;

$800 Year 1;

$872 Year 4.

$1,672 total

Sincerely Yours,

GLOBAL ANIMAL HEALTH TANZANIA ★ P. O. BOX 14443, ARUSHA

Godfrey A. Kassanga
Administrative Manager/Finance and Operations

Global Animal Health Tanzania.

WASHINGTON STATE UNIVERSITY
FACILITIES AND ADMINISTRATIVE COST PROPOSAL
FYE JULY 1, 2015
TO FYE JUNE 30, 2019

EXHIBIT A

	ORGANIZED RESEARCH								
	JULY 1, 2015 THROUGH JUNE 30, 2016			JULY 1, 2016 THROUGH JUNE 30, 2017			JULY 1, 2017 THROUGH JUNE 30, 2019		
		ON-CAMPUS	OFF-CAMPUS		ON-CAMPUS	OFF-CAMPUS		ON-CAMPUS	OFF-CAMPUS
BUILDING		5.3%			7.1%			7.3%	
EQUIPMENT		2.7%			2.6%			2.8%	
OPERATIONS & MAINTENANCE		15.3%			12.8%			12.9%	
INTEREST		0.3%			2.2%			2.5%	
LIBRARY		1.4%			0.6%			0.8%	
UTILITY COST ADJUSTMENT					0.7%			0.7%	
GENERAL ADMINISTRATION	8.5%			9.2%			9.2%		
DEPARTMENT ADMINISTRATION	14.6%			14.2%			14.2%		
SPONSORED PROJECTS ADMINISTRATION	2.9%			2.6%			2.6%		
STUDENT SERVICES ADMINISTRATION									
ADMINISTRATION COMPONENTS	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
TOTAL		51.0%	26.0%		52.0%	26.0%		53.0%	26.0%

	INSTRUCTION & DEPARTMENT RESEARCH			OTHER SPONSORED ACTIVITIES		
	JULY 1, 2015 THROUGH JUNE 30, 2019			JULY 1, 2015 THROUGH JUNE 30, 2019		
		ON-CAMPUS	OFF-CAMPUS		ON-CAMPUS	OFF-CAMPUS
BUILDING		10.5%			2.5%	
EQUIPMENT		1.5%			0.5%	
OPERATIONS & MAINTENANCE		11.5%			5.5%	
INTEREST		1.5%			0.5%	
LIBRARY		6.5%			1.0%	
GENERAL ADMINISTRATION	7.4%			9.4%		
DEPARTMENT ADMINISTRATION	11.2%			13.9%		
SPONSORED PROJECTS ADMINISTRATION	0.4%			2.7%		
STUDENT SERVICES ADMINISTRATION	7.0%					
ADMINISTRATION COMPONENTS	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
TOTAL		57.5%	26.0%		36.0%	26.0%

ADMINISTRATIVE COMPONENTS ARE CAPPED AT 26.0% IN ACCORDANCE WITH OMB A-21, DATED JULY 26, 1993.

CONCUR:

Matthew A. Skinner
(SIGNATURE)

ASSOC. VICE PRESIDENT OF FINANCE
TITLE

JANUARY 6, 2016
DATE

WSU budget documentation

Expedia

List your property Hello, Sara My Lists 4 My Trips Support Español 简体中文

Flights Hotels Bundle and Save Cars Cruises Things to Do Vacation Rentals Deals

Rewards Mobile

Review your trip

Trip Summary

Trip Summary

Trip Total: **$964.60**

Rates are quoted in US dollars

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Nice Job! You picked one of our cheapest flights.
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Sun, Feb 2 From **Heathrow (LHR)** To **Kilimanjaro Intl. (JRO)**

Kenya Airways **Cheapest**

5:25pm	→	9:30am	13h 5m, 1 stop
LHR		JRO	NBO
			Arrives Mon, Feb 3

Show flight and baggage fee details

Sat, Feb 8 From **Kilimanjaro Intl. (JRO)** To **Heathrow (LHR)**

Kenya Airways **Cheapest**

9:35pm	→	10:45am	16h 10m, 2 stops
JRO		LHR	DAR, AMS
			Arrives Sun, Feb 9

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The Rickshaw Travels Ltd.
Plot No 1006, Buzwagi Street, Msasani Peninsula, Dar es Salaam, Tanzania
Tel: +255 22 2602 303/304/305/610/612/613 |
Email: accounts@rickshawtravels.com
TIN 100 153 572 | VRN 100 006147 J

PROFORMA INVOICE

To:
******Cash Sales**

Dar Es Salaam, Tanzania

Proforma#: TZ1909-2493/TS
Date: 25/09/2019
Currency: USD.

Service	Description	Amount
AIR TICKET	Passenger Name: FELIX LANKESTER AIR EXCEL 11-Oct-19 041 Seronera 11:05 Arusha 12:10	241.00
Amount in Words (USD.): Two Hundred Forty One And Forty One Cents Only	Total Amount (USD.)	**241.00**
Amount in Words (TZS): Five Hundred Fifty Nine Thousand One Hundred Twenty And Twenty Cents Only	Total Amount (TZS.)	**559,120.00**

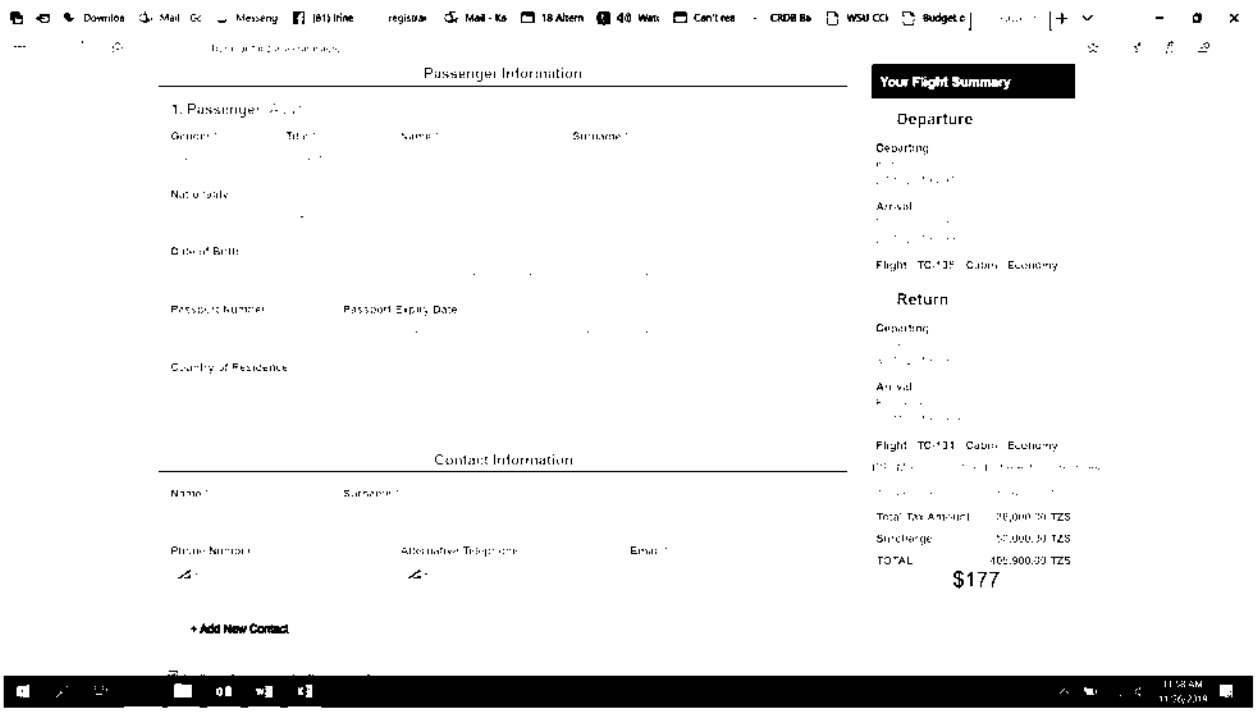
For Rickshaw Travels Ltd.

Account Name: The Rickshaw Travels Ltd

Bank of Africa Tanzania Ltd
P.O.Box 3054, Dar es Salaam, Tanzania
Account Number [redacted] (USD) | **10200127013** (TZS)
Swift Code: **E U A F T Z T Z**

Diamond Trust Bank (T) Ltd
P.O Box 115, Dar Es Salaam, Tanzania
Account Number [redacted] (USD) | **017264001** (TSH)
Swift Code: **D T K E T Z T Z**

**This is a computer generated document and no signature is required.*



Passenger Information

1. Passenger

Gender * Title * Name * Surname *

Nationality

Date of Birth

Passport Number Passport Expiry Date

Country of Residence

Contact Information

Name * Surname *

Phone Number Alternative Telephone Email *

+ Add New Contact

Your Flight Summary

Departure

Departing

Arrival

Flight TC Cabin Economy

Return

Departing

Arrival

Flight TC Cabin Economy

Total Tax Amount 28,000.00 TZS

Surcharge 57,000.00 TZS

TOTAL 185,900.00 TZS

$177

Trip Summary

Trip Summary ˅

Trip Total: **$315**.25

Only 7 tickets left at this price!

Rates are quoted in US dollars

50093 customers protected their flight in the last 7 days. Add flight protection when you check out.

✔ **Nice Job! You picked one of our cheapest flights.**
Book now so you don't miss out on this price!

Sun, Feb 9

From Heathrow (LHR)
To Roissy-Charles de Gaulle (CDG)

Alitalia — Cheapest

4:55pm	→	11:30pm	5h 35m, 1 stop
LHR		CDG	FCO

Fare Rules and Restrictions:

- Pay to choose your seat
- Bring a carry-on bag

Show flight and baggage fee details ˅

Sat, Feb 15

From Roissy-Charles de Gaulle (CDG)
To Heathrow (LHR)

Air France — Cheapest

4:10pm	→	4:35pm	1h 25m, Nonstop
CDG		LHR	

Fare Rules and Restrictions:

- Pay to choose your seat
- Bring a carry-on bag

Show flight and baggage fee details ˅

‹ Change flights

Upgrade your flight

Get more comforts and benefits by adding an upgrade.

Heathrow (LHR) → Roissy-Charles de Gaulle (CDG)
5h 35m

- Relax while packing! Get free bags
- Enjoy more flexibility with free cancellation
- Choose seats at no extra charge

Show upgrades ˄

from
+ $58.61
for all travelers

U.S. DEPARTMENT of STATE
BUREAU of ADMINISTRATION

Foreign Per Diem Rates In U.S. Dollars
DSSR 925

Country: TANZANIA
Publication Date: 11/01/2019

Country Name	Post Name	Season Begin	Season End	Maximum Lodging Rate	M & IE Rate	Maximum Per Diem Rate	Footnote	Effective Date
TANZANIA	Arusha	01/01	12/31	143	91	234	View	06/01/2019
TANZANIA	Dar Es Salaam	01/01	12/31	207	106	313	View	06/01/2019
TANZANIA	Dodoma	01/01	12/31	112	60	172	N/A	06/01/2019
TANZANIA	Morogoro	01/01	12/31	137	60	197	View	06/01/2014
TANZANIA	Other	01/01	12/31	110	47	157	View	06/01/2014
TANZANIA	Zanzibar	01/01	12/31	187	106	293	View	06/01/2019

From: Dr. Melinda Rostal
To: (b)(6)
Cc: Awadallah, Michael S CIV DTRA AL (USA); Aleksei Chmura
Subject: [Non-DoD Source] Re: FRBAA14-6-2-0356
Date: Friday, May 22, 2020 3:17:44 PM

Dear (b)(6)

Mr. Joe Ricardi will speak to you about the difference in the total between when the budget was originally submitted on March 26, 2019 and when we submitted the documentation you requested for all costs on December 5, 2019. Unfortunately, our offices are closed both today and Monday for the observation of Memorial Day. He will be able to speak to you on Tuesday.

He has your (b)(6) phone number.

Kind regards,

Mindy

Melinda Rostal DVM, MPH, PhD
Principal Scientist, Vector-Borne Diseases

Rift Valley Fever Virus Project Manager

EcoHealth Alliance
460 West 34th Street, Suite 1701
New York, NY 10001

1.212.380.4489 (direct)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

On May 22, 2020, at 9:31 AM, (b)(6)
Caution-(b)(6) > wrote:

Good Morning,

I noticed the proposal came in at $4,848,483.14 but the detail excel spreadsheet I have, that was emailed on 12/16/19, states $4,995,106.37.

V/r

(b)(6) Contractor

Contract Specialist ▪ Broadleaf

Defense Threat Reduction Agency (DTRA)

Office Phone: (b)(6)

(b)(6)

From: Dr. Melinda Rostal
To: (b)(6)
Cc: Aleksei Chmura; Joe Riccardi; Amanda Andre; Whitney Bagge; (b)(6)
Subject: Re: [Non-DoD Source] Re: FRBAA14-6-2-0356 Clarification Questions 1/3
Date: Monday, December 16, 2019 2:40:19 PM
Attachments: 02 - FRBAA14-6-2-0356 - KCRI Budget Justification.pdf
FRBAA14-6-2-0356 Clarifications.xlsx
02 - FRBAA14-6-2-0356 - KCRI Documentation.pdf
FRBAA14-6-2-0356 Detailed Budget.xlsx
03 - FRBAA14-6-2-0356 - OHCD PMO Budget Justification.pdf

Dear (b)(6)

I have reattached the documentation here. All of the documentation is 23.8MB, perhaps that is why it did not go through? I will split it into three emails and send smaller emails. Please confirm receipt of the three emails. 1. The budget, response, 01 EHA Justification, 02, KCRI Justification, 02 KCRI documentation. Please note that the 01 EHA documentation was the largest file (11.3MB) and so that one was sent in the second email.

Please find attached the documentation requested for our FRBAA14-6-2-0356 cost proposal. We have responded to the clarification questions and indicated both the document and page number where the full documentation/justification may be viewed. For each partner we have provided two files:

(a) a PDF document of our updated justification using tracked changes according the the current costs for all items based on the documentation
(b) a PDF of the documentation that was requested on the clarification sheet

We have also included an Excel spreadsheet that includes our calculations for all costs and all partners corresponding to our updated justifications and documentation. Necessarily and following the documentation now provided, various costs have changed since our initial submission in April 2018 and our budget has been updated accordingly. Therefore, our overall budget request has also increased to $4,995,106.37 with annual amounts as follows.

Y1: $999,888.16
Y2: $997,047.51
Y3: $999,782.70
OY1: $998,704.80
OY2: $999,683.19.

Please email anytime or contact me directly at +1.212.380.4489 with any questions about our documentation, cost proposal, or other details.

Best,

Mindy

Melinda Rostal DVM, MPH
Principal Scientist, Vector-Borne Diseases

Rift Valley Fever Virus Project Manager

KCRI Budget Justification

A. Senior Personnel

We request a total of S3 ,000 to support Key Personnel over the five years of the proposed project.

Blandina Mmbaga, Co-PI, Epidemiologist, will commit 1.2 months per year. We request salary of $6,000 in Year 1- . Co-PI Mmbaga is the Research Director of KCRI and holds a PhD in Public Health and Epidemiology. Co-PI Mmbaga will contribute to the study design, lead the implementation of field work with human subjects and the laboratory analysis of human samples, provide training and mentorship, develop policy recommendations and facilitate collaboration with stakeholders.

B. Other Personnel

We request a total of S2 , to support Other Personnel over the five years of the proposed project.

Technicians. We request $2,000 per year in Y1-2 for a laboratory technician, who will commit 1 months per year to aliquot the serum samples that come in from the field and store them. laboratory technician will increase the time commitment to months , and laboratory technician will be hired committing 12 months per year, for which we are requesting per technician to complete the ELISA testing on the human sera collected in Y1, Y2 and OY1.

Nurses. We request S 4,000 over the five years of the project for two nurses. In Y1- , we request support for nurse who will commit months per year at a rate of $12,000 who will collect blood samples from participants in the serosurvey (Task 2). In OY1 of the project, we who will commit months for the year in order to collect blood samples for the incidence study .

Administrator. We request $2,400 in Y1 to support a Program Administrator who will assist co-PI Mmbaga in the administration of the project. We request a total of $12,000 over the five years of the project.

Anthropologist/Epidemiologist. We request S ,000 for an Anthropologist/Epidemiologist, with a 3% increase in subsequent years, who will commit 12.0 months Y1-2, OY1 and 6 months in Y3 to contribute to the development of the serosurvey and incidence studies, field data collection and data analysis.

We request $10,500 over the five years of the project to support a Finance Specialist who will commit .84 months per year for Y1-5. The Finance Specialist will work with project staff to ensure timely invoicing for all program expenses.

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D. Travel

We request $3,500 , with a 3% annual increase, for travel. This will cover a travel stipend of $35 per day for 100 days in each of Y1 and Y2 for the original serosurvey 15 days in OY1 for the incidence study while they are working in the field. We request $18, over the five years.

E. Participant Support Costs

We request a total of $1,80 for a CCHFV Diagnostics Training Workshop Y3 of the project. We will host a workshop to train participants from local and national public health laboratories to conduct CCHFV ELISA and PCR testing as well as to understand the importance of including CCHFV as a differential diagnosis.

F. Other Direct Costs

We request a total of $8 , for other direct costs over the five years of the proposed project.

We request $2,4 for the storage of samples in Y1 of the project, and an increase of 5% in each subsequent year for a total of $13, over the five years of the project We request $14, for laboratory access and utilization for the processing of human IgG ELISA samples in Y3 of the project, and an increase of 5% in Y for a total of $29, over the five years of the project. There is a separate cost to perform the tests, for which we request a total of $42,656, $10,66 in Y3 to perform 800 tests and $31,99 in Y to perform 2400 tests all at a cost of 30,000 Tanzanian Shilling, or $13.33 USD, per test.

H. Indirect Costs

We request a total of $4 in overhead, a rate of 10% per year, over the five years of the proposed project.

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Meals 11 participant * 15 USD per meal (breakfast and lunch and evening tea) per day*5 days 900USD.
Transport 0.65 USD/km for local pick up.

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Deleted: Local transport 25 km per day 0.65USD*5days=81.25USD.
Venue 50 USD per day *5 = 500USD.
Stationaries pens, files and training material 125 USD

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	DTRA Questions	EcoHealth Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff as well as that of the positions created by this grant	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 1
2	Please justify the 5% increase, per year, for key personnel	All salaries for key personnel are increased annually by 5% due to the exceptionally high cost of living increases in New York City where we are headquartered. EcoHealth Alliance bases this calculation on the Consumer Price Index plus an annual merit increase.	
3	For the 4 wheel drive, specifically: - More detailed description as to why this is needed - What is the plan to disposition of the four wheel drive - The comparison between renting and buying	We request a 4x wheel drive land cruiser/jeep for driving off roads (the roads in Tanzania are very poorly maintained) for 6 passengers (driver/technician, field coordinator, vet, nurse, PhD student, TAWIRI wildlife team member, plus equipment). A 6-person land cruiser is available for rent from Dar es Salaam (very few vehicles are available from Arusha). The cost is $3,112.27 per month (see documentation attached). We will need a vehicle daily for field work, visiting the communities prior to the start and at the end of the work for Years 1, 2 and OY1. Thus, the cost for these three years for 6 people = $3112.27 x 2 vehicles x 36 months = $224,083.44. Additionally, we will need a vehicle to move between laboratories, meet with collaborators and prepare for workshops during Years 3 and OY2, which would increase the cost of the rental vehicle even higher. Finally, one is not permitted to drive the rental vehicle into the national parks, which would mean our team would not be able to access one of the three environmental disturbance levels. Thus, it is far more economical for the project for us to purchase two vehicles rather than rent them. The only way to access our study areas is to drive. For each sampling trip in years 1-2 we will need to bring supplies for rodent, livestock and human sampling as well as a dry shipper for tick sampling. Additionally, the rodent sampling will take three days per site, whereas the human and livestock sampling will only take one day. Thus, the team can increase their efficiency by having the rodent sampling team in a separate vehicle from the human sampling team. Additionally, when the PIs join the team in the field they will need additional seating, which will be provided by two vehicles. At the end of the project, the vehicle will be transferred for use on other zoonotic disease research projects that our collaborators at EcoHealth Alliance or GAHI are working on	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 2-7, 01 - FRBAA14-6-2-0356 - EHA Budget Justification Pg 2
4	Please provide a breakdown of the proposed materials and equipment, to include quantities and unit prices. Please provide documentation (quotes, screen shots, links, etc.) to support the proposed prices	A detailed breakdown is provided in the FRBAA14-6-2-0356 Detailed Budget and documentation of all items is provided in the EHA Documentation file.	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 8-80, FRBAA14-6-2-0356 Detailed Budget, Tabs Prime Budget, EHA Travel Budget, EHA Materials and supplies and Visas and Permits
5	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	We have provided our federally negotiated indirect rate in the documentation and applied this to all modified direct costs	01 - FRBAA14-6-2-0356 - EHA DocumentationPg p67
6	Documentation to justify the permit needed to enter Tanzania	The cost of non-Tanzanians obtaining research permits to conduct research in Tanzania includes: A COSTech research permit ($300 and $50 = $350). Then there is the additional TAWIRI permit, which is $3,800 per person ($1,800 for the research fee and in Y1 and Y2 and additional $2,000 for the animal protection area fee). The documentation is provided.	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 53-56, 01 - FRBAA14-6-2-0356 - EHA Budget Justification Pg 2-5
7	What does the misc. travel cost entail	The misc. travel costs are requested to cover ground transportation round trip to/from the airport or train station in NYC and to/from the hotel at the meeting location. These are estimated at a $25 taxi ride each way per person	01 - FRBAA14-6-2-0356 - EHA Budget Justification Pg 2-5
8	Please explain how you came up with the cost associated with the international and domestic conferences	Domestic travel estimates are based on attending the APHA Conference which for 2018 was held in San Diego, CA. Therefore the estimates are based on the per diem of $173 for lodging and $71 for meals and incidentals per day for a total of $245 and conference registration fees of $700. International travel is based on attending the International Conference on Veterinary Epidemiology and Animal Health in Paris, France. Therefore the estimates are based on the per diem of $391 for lodging and $169 for meals and incidentals for a total of $560 and conference registration fees of 450 EURO, or $500	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 69-74; 01 - FRBAA14-6-2-0356 - EHA Budget Justification Pg 2-5
9	Please provide documentation to justify the conference space, amenities and printing documents for stakeholders meeting	We provided a quote from the Sheraton for facilities for our stakeholder meeting in November 2019 in Pretoria South Africa for a similar DTRA project.	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 78-80
10	Please provide documentation to justify the rental of a conference facility for the CCHF Symposium in OY2	We provided a quote from the Sheraton for facilities for our stakeholder meeting in November 2019 in Pretoria South Africa for a similar DTRA project.	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 78-80
11	Please provide documentation for cost of recruitment of the Tanzanian post doctoral fellow in OY2	The costs associated with recruiting the Tanzanian post-doctoral fellow in OY2 include: the costs of the legal and visa filing fees associated with obtaining a work visa for the fellow ($450 for the application filing fee, $2,030 for the legal fees, $2,000 for the flight). As well as moving expenses etc. that will need to be reimbursed to the fellow ($1,500 for housing until an apartment is found, $910 for moving belongings)	01 - FRBAA14-6-2-0356 - EHA Documentation Pg 74-77

	DTRA Questions	KCRI Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at KCRI.	02 - FRBAA14-6-2-0356 - KCRI Documentation Pg 2
2	Please break down ODCs and provided documentation to justify any cost	We have provided the requested documentation in the documentation and updated justification files.	02 - FRBAA14-6-2-0356 - KCRI Documentation Pg 3-6; 02 FRBAA14 6 2 0356 KCRI Budget Justification Pg 2
3	For all travel proposed whether domestic and international, please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc.	Travel costs include a stipend of $35 per day (non-governmental rate) for 100 days in each of Y1 and Y2 for the original serosurvey and 151 days in OY1 for the incidence study for the nurse(s) while they are working in the field.	FRBAA14-6-2-0356 - KCRI Documentation Pg 6-7; 02 - FRBAA14-6-2-0356 - KCRI Budget Justification Pg 2
4	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	Please see above explanation of travel costs	FRBAA14-6-2-0356 - KCRI Documentation Pg 6-7; 02 - FRBAA14-6-2-0356 - KCRI Budget Justification Pg 2
5			

	DTRA Questions	OneHealth Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at OHCD.	03 - FRBAA14-6-2-0356 - OHCD Documentation Pg 1 -2
2	For all travel proposed whether domestic and international. please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc.	Dr. Assenga and Dr. Bernard may attend project meetings held in Tanzania and take other meetings to improve One Health stakeholder relationships. This will cover four trips per year, for 2 days each with local transportation estimated at $40 per trip and per diem expenses of $55 per day (government standard rate).	03 - FRBAA14-6-2-0356 - OHCD Justification Pg 1; 06 - FRBAA14 G 2 0356 TVLA Documentation Pg 1
3	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	Please see above explanation of travel costs For documentation of the government stiperd ($55) please see the TVLA documenation.	06 - FRBAA14-6-2-0356 - TVLA Documentation Pg 1
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	DTRA Questions	Public Health Responses	Document and Page number
1	Please provide documentation to support the proposed salaries, key personnel and other personnel	Please see the attached documentation of the salaries of current staff at PHE.	04 - FRBAA14-6-2-0356 - PHE Documentation Pg 2
2	Please break down ODCs and provided documentation to justify any cost	Please see the documentation file for the break down of ODCs (items 2 and 3) and accompanying documentation of international travel (item 3). This documentation includes an explanation of international travel required, the cost per CCHF virus neutralisation test (under materials and supplies) a quote for shipment of samples from Tanzania to the UK (under postage of samples), and an estimate for inflation in costs, as the activity is scheduled for four years from now (OY2).	04 - FRBAA14-6-2-0356 - PHE Documentation Pg 3-5
3	Please provide a breakdown of the proposed materials and equipment, to include quantities and unit prices. Please provide documentation (quotes, screen shots, links, etc.) to support the proposed prices.	Please see the documentation file outlining the agreed upon total unit cost per test under materials and supplies in item 2	04 - FRBAA14-6-2-0356 - PHE Documentation Pg 3
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	Please see the documentation file, item 4 (current rate agreement) and item 5 (explanation of how the rate is used) for the federally negotiated rate.	04 - FRBAA14-6-2-0356 - PHE Documentation Pg 6-9
5	Please provided documentation to justify facility cost	Please see the documentation file, item 6, which describes both the overall cost for utilizing the BSL-4 laboratory for 2 weeks, as well as provides Table 1, which includes the cost breakdown for the facility.	04 - FRBAA14-6-2-0356 - PHE Documentation Pg 10-11
6			

	DTRA Questions	TAWIRI Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at TAWIRI.	05 - FRBAA14-6-2-0356 - TAWIRI Documentation Pg. 1
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	DTRA Questions	TVLA Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at TVLA.	06 - FRBAA14-6-2-0356 - TVLA Documentation Pg 2
2	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	We have provided a breakdown of all travel proposed in the updated budget justification.	06 - FRBAA14-6-2-0356 - TVLA Documentation Pg 2; 06 - FRBAA14-6-2-0356 - TVLA Budget Justification Pg 1
3	Please provide documentation to support ODCs (screenshots links, quotes, etc.)	We have provided documentation in support of the ODCs in the Documentation file .	06 - FRBAA14-6-2-0356 - TVLA Documentation Pg 2-4
4			

	DTRA Questions	UoG Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at UoG	07 - FRBAA14-6-2-0356 - UoG Documentation Pg 2
2	For all travel proposed whether domestic and international, please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc.	Screenshots for flight prices between Glasgow and Dar es Salaam, Glasgow and Kilimanjaro, and Kilimanjaro and Dar es Salaam are provided in the documentation attached. The breakdown of all costs associated with travel is provided in the updated justification.	07 - FRBAA14-6-2-0356 - UoG Documentation Pg 3-8; 07 - FRBAA14 G 2 0356 UoG Budget Justification Pg 1-2
3	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	The breakdown of all costs associated with travel is provided in the updated justification	07 - FRBAA14-6-2-0356 - UoG Budget Justification Pg 1-2
4	Please provide documentation to support ODCs (screenshots links, quotes, etc.)	Documentation is attached to confirm the costs of direct costs including shipping and lab expenses including testing kits. Full explanation of costs is outlined in the updated justification.	07 - FRBAA14-6-2-0356 - UoG Documentation Pg 9-16; 07 - FRBAA14 G 2 0356 UoG Budget Justification Pg 2-3
5	Please break down participant costs	We request $3,300 in Y3 for travel subsistence costs for participants at a rate of $55/day (standard government rate) over 5 days for 10 participants, who will attend 2 trainings. The costs for the UoG trainer are covered by travel costs (above).	07 FRBAA14 G 2 0356 UoG Budget Justification Pg 2

	DTRA Questions	WSU Responses	Document and Page number
1	Please provide documentation to support the proposed salaries (key personnel and other personnel)	Please see the attached documentation of the salaries of current staff at WSU. We have also documented a draft employment contract for the employees to be hired at the standard rate for GAHT/WSU. We have included a bill for annual insurance for 7 employees to document the annual cost of benefits. We have also included a current salary statement from GAHT (including salaries for Ms. Mollo and Mr. Kassagati) to document the cost of the social security tax (NSSF), which is 10% of the gross salary).	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 2-14
3	Please provide documentation to support ODCs (screenshots, links, quotes, etc.)	We have provided the documentation of all ODCs - this includes permits, insurance and medical waste management (individually described below) as well as a list of prices for office supplies. Please note that not all supplies are listed as stores in Tanzania do not have websites that indicate the prices and so we were not able to provide screen shots; however, we did provide a list of common office supplies and an example of a receipt for a recent purchase. An estimate for the translations was also provided.	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 15-38; 08 - FRBAA14-6-2-0356 - WSU Budget Justification Pg 4-5
4	Please provide any current agreements with or submissions to either DCMA or DCAA. Please also explain how the rates in these documents are utilized in the proposal calculations	WSU has a federally negotiated rate for overhead. The documentation attached includes a rate for work that takes place off campus (as our project does).	WSU Documentation Pg 39-44
5	Need documentation to justify the permit needed to enter Tanzania	Documentation is provided for the following costs: all non-Tanzanians must pay a $400 application fee for a COSTech permit (the fee is only $50 for Tanzanians); once the COSTech application is approved, each non-Tanzanian researcher must pay a $1500 fee to conduct research in Tanzania. In Years 3 and 4 there is an additional fee for working in a critical protected area (Serengeti of $2000	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 15-18; 08 - FRBAA14-6-2-0356 - WSU Budget Justification Pg 15-16
6	Need documentation to justify medical waste management (screenshots, links, quotes)	Documentation is provided for the cost of medical waste incineration. This will be necessary to handle the biohazardous waste that is produced during the field sampling.	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 25
7	Please provide documentation to support equipment insurance (screenshots, links, quotes, etc.)	The only equipment that is required to be insured are the project vehicles. As in the US there is a lower cost if the vehicle will be used for fewer kilometers in a year ($692 vs the $1,364 cost documented) as this is the years without field work (Y3 and Y4).	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 21-22
8	For all travel proposed whether domestic and international, please provide (screenshots or links) the departure and arrival locations, number of trips, purpose of each trip, length of each trip, number of travelers, etc	Screen shots for the cost of a flight was documented for all proposed travel between London and Arusha (JRO), Arusha and Dar es Salaam, Arusha and Seronera (Serengeti) and London and a European city. The number, purpose and length of each trip and the number of travelers is specified in the budget justification	08 - FRBAA14-6-2-0356 - WSU Documentation Pg 45-49; FRBAA14-6-2-0356 Detailed Budget, Tab WSU_08 - FRBAA14-6-2-0356 - WSU Budget Justification Pg 1-3
9	For all travel proposed (domestic and international), please provide a breakdown of the travel costs (airfare, ground transportation, lodging, per diem, etc.).	The breakdown of all costs associated with travel is provided in the justification.	08 - FRBAA14-6-2-0356 - WSU Budget Justification Pg 1-3; 08 - FRBAA14-6-2-0356 - WSU Documentation Pg 45-50; FRBAA14-6-2-0356 Detailed Budget, Tab WSU
10			

Budget Documentation – Kilimanjaro Clinical Research Institute

KCRI Kilimanjaro Clinical Research Institute
Academic Centre for Evidence Based Health Interventions of the Good Samaritan Foundation

P.O.BOX 2236
Moshi,Tanzania
Telephone: 255-27-2754201
Fax: 255 27 2753368

Email: keriadmin@kcri.ac.tz
Website: http://www.kcmc.ac.tz
Website: http://www.kcri.ac.tz
Date: 20-11-2019

Dear Melinda Rostal

I am writing to confirm the salaries mentioned in Cremean Congo Hemorrhagic Fever study for KCRI personnel as listed below.

Personnel-KCRI	Annual salary	Monthly salary
Scientist – Local PI	$ 60,000.00	$ 5,000.00
Senior- Lab Technician 1	$ 24,000.00	$ 2,000.00
Lab Technician 2	$ 12,000.00	$ 1,000.00
Lab Technician 3	$ 12,000.00	$ 1,000.00
Nurse 1	$ 12,000.00	$ 1,000.00
Nurse 2	$ 12,000.00	$ 1,000.00
Administrator	$ 24,000.00	$ 2,000.00
Anthropologist/epidemiologist	$ 24,000.00	$ 2,000.00
Scientist 2 -Veterinary	$ 30,000.00	$ 2,500.00
Scientist 3-Physician	$ 30,000.00	$ 2,500.00
Finance	$ 30,000.00	$ 2,500.00

CPA(T) Gilbert Shao
Chief accountant - KCRI

Serial No: 1840

Laboratory Access/Rental Fee

KCRI Kilimanjaro Clinical Research Institute
Academic Centre for Evidence Based Health
Institution of the Good Samaritan F
P O Box 2236
KCRI -KCMC
MOSHI
Tel: +255(27)2754201
Fax: +255(27)2753368
Email: kcriadmin@kcri.ac.tz
Website: www.kcri.ac.tz

TO: .....
.....
.....

INVOICE

S/N	DESCRIPTION	AMOUNT (TSHS/US$/EU)
	Laboratory Access	1,200
	and the training	
	SUB TOTAL	
	TOTAL	

Amount in words .....
.....

BANK DETAILS:

BANK NAME: .....

ACCOUNT NAME:..

ACCOUNT No. ..... (b)(4)

BRANCH:.....

SWIFT CODE: ..... (b)(4) .....

SORT CODE: ....

Serial No: 2809

Sample Storage Fee

KCRI Kilimanjaro Clinical Research Institute
Academic Centre for Evidence Based Health Interventions
Institution of the Good Samaritan Foundation
P O Box 2236
KCRI -KCMC
MOSHI
Tel: +255(27)2754201
Fax: +255(27)2753368
Email: kcriadmin@kcri.ac.tz
Website: www.kcri.ac.tz

TO: .....
.....
.....

INVOICE

S/N	DESCRIPTION	AMOUNT (TSHS/US$/E/L)
	[redacted]	
	[redacted]	[redacted]
	[redacted]	
	[redacted]	[redacted]
	[redacted]	
	[redacted]	[redacted]
	Sample storage	
	[redacted]	1,214,76
	SUB TOTAL	
	TOTAL	

Amount in words .....
.....

BANK DETAILS:

BANK NAME: .....

ACCOUNT NAME: .....

ACCOUNT No. ..... (b)(4) .....

BRANCH: .....

SWIFT CODE: ..... (b)(4) .....

SORT CODE: ....

Serial No: 1838

Venue Fee for Workshop in Y3

KCRI Kilimanjaro Clinical Research Institute
Academic Centre for Evidence Based Health Interventions
Institution of the Good Samaritan Foundation
P O Box 2236
KCRI -KCMC
MOSHI
Tel: +255(27)2754201
Fax: +255(27)2753368
Email: kcriadmin@kcri.ac.tz
Website: www.kcri.ac.tz

TO: .....
.....
.....

INVOICE

S/N	DESCRIPTION	AMOUNT (TSHS/US$/E/L)
	SUB TOTAL	
	TOTAL	

Amount in words .....
.....

BANK DETAILS:

BANK NAME: .....

ACCOUNT NAME:.....

ACCOUNT No. ..... (b)(4)

BRANCH:.....

SWIFT CODE: ..... (b)(4) .....

SORT CODE: .....

Cost per test and non-governmental daily stipend rate

KCRI Kilimanjaro Christian Medical Research Institute
Academic Centre for Evidence Based Health Interventions of the Good Samaritan Foundation

P.O.BOX 2236
Moshi, Tanzania
Telephone: 255-27-2754201
Fax: 255 27 2753368

Email: keriadmin@kcri.ac.tz
Website: http: www.kcmc.ac.tz
Website: http: www.kcri.ac.tz
Date: 24.11.2019

Dear Dr. Melinda Rostal,

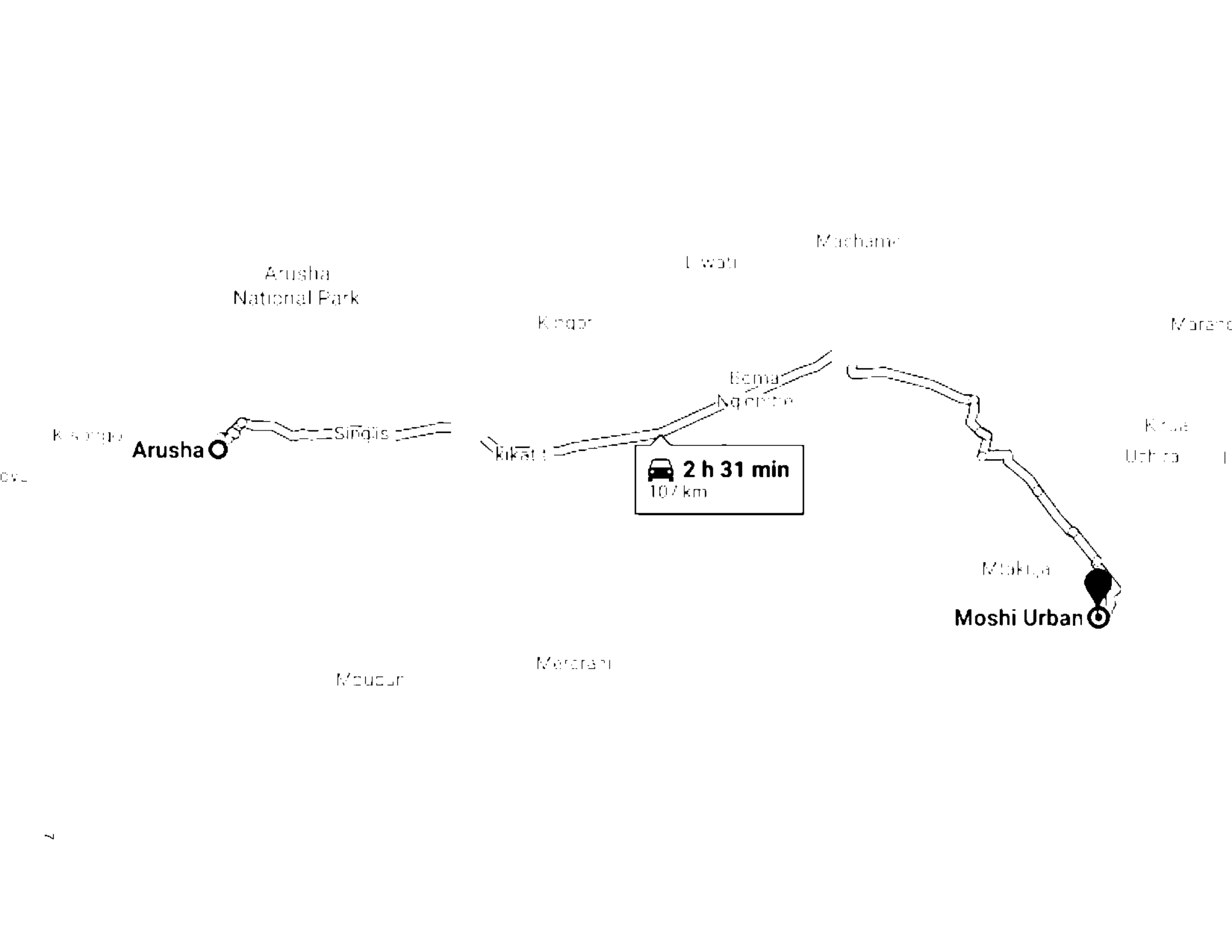
I am writing to confirm the agreed upon testing and travel costs for the Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania Project.

We have agreed to a fee of $13.33 per ELISA.

We have agreed to use the travel rate of $35 per day for our nurse while in the field.

Sincerely,

CPA(T) Gilbert Shao
Chief accountant – KCRI


Machame
Arusha
National Park
Kimara
Bema
Ngarenaro
Arusha
Singisi
Kikatiti
2 h 31 min
107 km
Makuyu
Moshi Urban
Maroran
Mauesa

ORGANIZATION NAME

Consultant Services ... TOTAL

Equipment ... TOTAL

Software ... TOTAL

International Travel	Base Costs	Y1	Y2	Y3	Y4	Y5	TOTAL
Traveler 1 - Mumba/Rexesh (Kinshasa) Base							
Ground Transportation Expenses	300	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	
Lodging Meals & Incidental Expenses Per Diem	284	$ 3,276.00	$ 3,276.00	$ 3,276.00	$ 3,276.00	$ 3,276.00	
Flight Economy	2400	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	
No. Days		7	7	7	7	7	
No. Trips per Year		2	2	2	2	2	
Total		$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 37,380.00
Traveler 2 - Mumba/Rexesh (Dares Salam) Base							
Ground Transportation Expenses	300	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	
Lodging Meals & Incidental Expenses Per Diem	513	$ 3,130	$ 3,130	$ 3,130	$ 3,130	$ 3,130	
Flight Economy	600	$ 600	$ 600	$ 600	$ 600	$ 600	
No. Days		5	5	5	5	5	
No. Trips per Year		2	2	2	2	2	
Total		$ 3,930.00	$ 3,930.00	$ 3,930.00	$ 3,930.00	$ 3,930.00	$ 19,650.00
Traveler 3 - Wyson Rexesh (Dares Salam) Base							
Ground Transportation Expenses	300	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Lodging Meals & Incidental Expenses Per Diem	513	$ 2,701	$ 2,701	$ 2,701	$ 2,701	$ 2,701	
Flight Economy	1000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
No. Days		7	7	7	7	7	
No. Trips per Year		1	1	1	1	1	
Total		$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 21,455.00
Traveler 4 - Fred Conservator (Kinshasa) Base							
Ground Transportation Expenses	300	$ 200.00	$ 200.00	$ 100.00	$ 200.00		
Lodging Meals & Incidental Expenses Per Diem	284	$ 3,276.00	$ 3,276.00	$ 1,638.00	$ 3,276.00		
Flight Economy	2400	$ 4,000	$ 4,000	$ 2,000	$ 4,000		
No. Days		7	7	7	7		
No. Trips per Year		2	2	1	2		
Total		$ 7,476.00	$ 7,476.00	$ 3,738.00	$ 7,476.00		$ 26,166.00
Traveler 5 - Mumba/Rexesh (Dares Salam) Above Base							
Ground Transportation Expenses	300	$ 200.00	$ 300.00	$ 100.00	$ 300.00		
Lodging Meals & Incidental Expenses Per Diem	513	$ 3,330	$ 5,130	$ 2,565	$ 5,130		
Flight Economy	600	$ 600	$ 600	$ 600	$ 600		
No. Days		5	7	5	9		
No. Trips per Year		2	2	1	2		
Total		$ 3,930.00	$ 3,930.00	$ 1,965.00	$ 3,930.00		$ 13,755.00
Days above Base to longer average planned Stay							$ 5,535.00
Traveler 5 - Mumba/Rexesh (Dares Salam) Above Base							
Ground Transportation Expenses	300	$ 100.00	$ 300.00	$	$	$	
Lodging Meals & Incidental Expenses Per Diem	513	$ 3,330	$ 5,130	$	$ 5,130	$	
Flight Economy	600	$ 600	$ 600	$	$ 600	$	
No. Days		5	7		9		
No. Trips per Year		2	2		2		
Total		$ 3,930.00	$ 3,930.00	$ -	$ 5,730.00	$ -	$ 13,590.00
Days above Base to longer average planned Stay							$ 5,535.00
Traveler 6 - Mumba/Rexesh (Dares Salam) Above Base							
Ground Transportation Expenses	300	$ 100.00	$ 300.00	$	$	$	
Lodging Meals & Incidental Expenses Per Diem	513	$ 3,330	$ 5,130	$	$ 5,130	$	
Flight Economy	600	$ 600	$ 600	$	$ 600	$	
No. Days		5	7		9		
No. Trips per Year		2	2		2		
Total		$ 3,930.00	$ 3,930.00	$ -	$ 5,730.00	$ -	$ 13,590.00
Days above Base to longer average planned Stay							$ 5,535.00
Traveler 7 - Wyson Rexesh (Dares Salam) Above Base							
Ground Transportation Expenses	300	$ -	$ -	$ -	$ 300.00	$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	513	$ -	$ -	$ -	$ 2,191	$ 2,191	
Flight Economy	2400	$ -	$ -	$ -	$ 2,000	$ 2,000	
No. Days					7	7	
No. Trips per Year					1	1	
Days above Base to longer average planned Stay							
Total		$ -	$ -		$ 4,491.00	$ 4,491.00	$ 8,982.00
Traveler 8 - Fred Conservator (Kinshasa) above Base							
Ground Transportation Expenses	300	$ 200.00	$ 300.00	$ -	$ 300.00	$ -	
Lodging Meals & Incidental Expenses Per Diem	284	$ 16,380	$ 21,840	$ -	$ 6,552	$ -	
Flight Economy	2400	$ 4,000	$ 4,000	$ -	$ 2,000	$ -	
No. Days		21	27	0	21		
No. Trips per Year		2	2	0	1		
Days above Base to longer average planned Stay		20	40	0	7		
Total		$ 20,580.00	$ 26,280.00	$ -	$ 8,852.00		$ 55,712.00
Traveler 9 - Fred Conservator (Dares Salam) above Base							
Ground Transportation Expenses	300	$ 100.00	$ 300.00	$ -	$ 300.00	$ -	
Lodging Meals & Incidental Expenses Per Diem	513	$ 1,565	$ 4,695	$ -	$ 1,565	$ -	
Flight Economy	600	$ 600	$ 600	$ -	$ 600	$ -	
No. Days		5	4		5		
No. Trips per Year		1	1		1		
Total		$ 1,965.00	$ 1,822.00		$ 1,965.00	$ -	$ 5,382.00
Traveler 10 - Research Assistant (Dares Salam)							
Ground Transportation Expenses	300	$	$			$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	513	$	$			$ 2,191	
Flight Economy	2400	$	$			$ 2,000	
No. Days						7	
No. Trips per Year						1	
Total			$ -			$ 4,491.00	$ 4,491.00
Traveler 9 - Carlos Zambrano (Kinshasa)							
Ground Transportation Expenses	300	$	$	$	$	$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	513	$	$	$	$	$ 2,191.00	
Flight Economy	2400	$	$	$	$	$ 2,000.00	
No. Days						7	
No. Trips per Year						1	
Total						$ 4,491.00	$ 4,491.00
Traveler 9 - Carlos Zambrano (Kinshasa)							
Ground Transportation Expenses	300	$	$	$	$	$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	513	$	$	$	$	$ 2,191.00	
Flight Economy	2400	$	$	$	$	$ 2,000.00	
No. Days						7	
No. Trips per Year						1	
Total			$ -			$ 4,491.00	$ 4,491.00
Traveler 9 - Carlos Zambrano (Kinshasa)							
Ground Transportation Expenses	300	$	$ 300.00	$ -	$	$ -	
Lodging Meals & Incidental Expenses Per Diem	513	$	$ 1,539.00	$ -	$	$ -	
Flight Economy	2400	$	$ 2,400.00	$ -	$	$ -	
No. Days			7				
No. Trips per Year			1				
Total			$ 4,239.00			$ -	$ 4,239.00
Traveler 10 - International Conference Attendance - Mbuji-Mayi, Democratic Republic of the Congo							
Ground Transportation Expenses	300		$ 300.00	$ 300.00	$ 300.00	$ 300.00	
Registration	998		$ 998.00	$ 998.00	$ 998.00	$ 998.00	
Lodging Meals & Incidental Expenses Per Diem Rate	500		$ 3,360	$ 5,320	$ 5,320	$ 5,320	
Flight Economy	1280		$ 1,280	$ 2,560	$ 2,560	$ 2,560	
No. Days			6	8	8	8	
No. Trips per Year			1	2	2	2	
Total			$ 5,238.00	$ 10,178.00	$ 10,178.00	$ 10,178.00	$ 35,772.00
Traveler 11 - Fred Doe							
Ground Transportation Expenses	300					$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	513					$ 4,382	
Flight Economy	2400					$ 4,000.00	
No. Days						7	
No. Trips per Year						2	
Total						$ 8,682.00	$ 8,682.00
Research Fees		$ 4,000.00	$ 6,500.00	$ 8,000.00	$ 6,000.00	$ 8,000.00	$ 32,500.00
YEARLY TOTALS		$ 67,006.00	$ 78,344.50	$ 36,542.00	$ 58,224.00	$ 54,278.00	$ 294,594.50
Amount of Research Fee not Included Per Line		$ 4,000.00	$ 4,300.50	$ 887.00	$ 496.00	$ 528.00	

Individual totals	Y1	Y2	Y3	Y4	Y5	Annual Base
Reveal	$ 20,468.00	$ 27,422.00	$ 11,436.00	$ 12,845.00	$ 13,136.00	$ 13,408.00
Rakesh	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 8,582.00	$ 8,582.00	$ 4,291.00
Lead Conservator	$ 11,960.00	$ 39,220.00	$ 5,720.00	$ 22,412.00	$ -	$ 13,408.00
Research Assistant	$	$ -	$ -	$ -	$ 4,291.00	
Zambrano	$	$ -	$ -	$ -	$ 4,291.00	
Unpaid	$	$ -	$ -	$ -	$ 8,582.00	
Fees	$ 4,000.00	$ 6,500.00	$ 8,000.00	$ 6,000.00	$ 8,000.00	$ 4,300.00
International Conference	$	$ 5,238.00	$ 10,178.00	$ 10,178.00	$ 10,178.00	
Total	$ 39,639.00	$ 76,509.50	$ 39,542.00	$ 58,224.00	$ 54,278.00	$ 33,408.00

Domestic Travel	Y1	Y2	Y3	Y4	Y5	
Traveler 1 - EXPA Technical Meeting						
Ground Transportation	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Lodging Meals & Incidental Expenses Per Diem	$ 1,250.00	$ 1,250.00	$ 1,250.00	$ 1,250.00	$ 1,250.00	
Flight/Train Estimate	$ 500	$ 400	$ 400	$ 400	$ 400	
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,750.00	$ 1,750.00	$ 1,750.00	$ 1,750.00	$ 1,750.00	$ 8,750.00
Traveler 2 - General Conference of EXPA						
Ground Transportation		$ 200.00	$ 200.00	$ 200.00	$ 200.00	
Lodging Meals & Incidental Expenses Per Diem	$ 245.00	$ 2,450.00	$ 3,430.00	$ 2,450.00	$ 3,430.00	
Flight/Train Estimate	$ 893	$ 1,190	$ 1,190	$ 1,190	$ 1,190	
No. Days		5	5	5	5	
No. Trips per Year		2	2	2	2	
Total		$ 3,840.00	$ 3,840.00	$ 3,840.00	$ 3,840.00	$ 15,360.00
Conference Expenses or Fees		$ 1,542.00	$ 1,542.00	$ 1,542.00	$ 1,542.00	$ 6,168.00
Grand Total All Years	$ 1,750.00	$ 7,132.00	$ 7,132.00	$ 7,132.00	$ 7,132.00	

	Y1	Y2	Y3	Y4	Y5	TOTAL
Participant Support Costs						
Traveler 1 - CONFERENCE Example						
Ground Transportation						
Lodging Meals & Incidental Expenses Per Diem				$ 20,400.00		
Flight/Train Estimate				$ 8,000		
No. Days				20		
No. Participants				20		
Total				$ 28,400.00		$ 28,400.00
Traveler 2 - [Enter Participant Description Here]						
Ground Transportation						
Lodging Meals & Incidental Expenses Per Diem				$ 12,350.00		
Flight/Train Estimate				$ 14,000		
No. Days				3		
No. Participants				7		
Total				$ 24,750.00		$ 24,750.00
Grand Total All Years	$ -	$ -	$ -	$ 53,150.00		

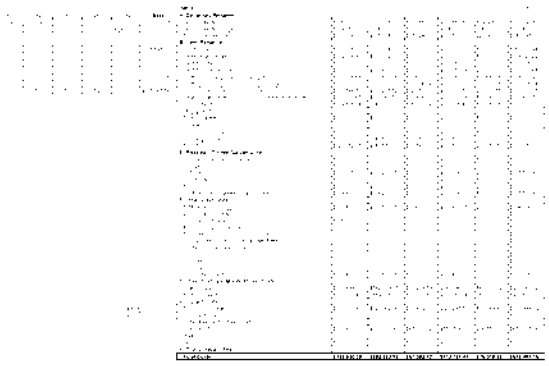
Item	Number in unit	Price per unit	Number needed Y1	Number need	Y1	Y2	Y3	Y4	Y5			
Shipping Costs	1	$ 3,011.00	3	1	$ 15,033.00	$ 15,483.99		$ 5,475.65				
Label Printer Supplies (5000 roll)	1	$ 133.45	3	2	$ 400.35	$ 412.36		$ 292.65				
Label printer ribbon (for 14,000 labels)	1	$ 28.89	1	2	$ 28.89	$ 29.76		$ 64.14				
Theory Computers	1	$ 2,125.00	2	1	$ 2,252.00	$ 2,126.00		$ 2,126.00	$ 2,126.00	$ 1,795.84	$ 442.12	$ - $ 354.79
Software Arc GIS	1	$ 1,000.00		1	$				$ 2,750.00			
Supplies for Graduate Students/Postdoc	1	$ 1,500.00	1	2	$ 1,500.00	$ 1,545.00	$ 3,182.70	$ 3,278.18	$ 3,376.53			
Label printer (Brady 300 dpi)	1	$ 3,366.10	1		$ 3,366.10							
Refrigerator	1	$ 2,740.00	1		$ 2,740.00							
Refrigerator Thermometer	1	$ 101.00	1		$ 101.00							
Multiscan ex plate reader Lamp	1	$ 174.10	1		$ 174.10							
Stereal microscope	1	$ 3,347.30	1		$ 3,347.30							
Water Distiller	1	$ 2,458.50	1		$ 2,458.50							
pH Meter	1	$ 257.02	1		$ 257.02							
ELISA Washer	1	$ 4,514.48	1		$ 4,514.48							
Fridge for vehicles	1	$ 3,795.00	2		$ 7,590.00							
Backup battery for fridge	1	$ 1,495.00	2		$ 2,990.00							
Nunc 1.8 internal cryovials	1800	$ 967.73	3	7	$ 2,903.19	$ 2,990.29		$ 3,177.39				
Serum tubes 10 ml	1000	$ 331.66	3	3	$ 994.98	$ 1,024.83		$ 1,087.24				
Serum tubes 3 mL	1000	$ 251.62	2	1	$ 503.24	$ 259.47						
Seum 1.3m - or smaller?	100	$ 35.50	5		$ 182.50	$ 187.98						
Vaccutainer holder	1000	$ 91.90	3	2	$ 275.70	$ 283.97		$ 903.79				
21g 1in vacutainer safety needles	480	$ 339.50	2	3	$ 679.00	$ 699.37		$ 1,112.94				
3cc luer lock syringe	1000	$ 195.73	2		$ 391.46	$ 204.65						
22g 1in needle (for vaccutainer)	1000	$ 270.89	1		$ 270.89	$ 278.02						
22g 1in needle (for syringe)	1000	$ 219.36	2		$ 438.72	$ 224.91						
1cc syringe and needle	1000	$ 713.21	1		$ 713.21	$ 719.61						
thumb forceps to collect ticks	1	$ 9.00	2		$ 18.00	$ 18.54						
tubes to put ticks in	500	$ 415.00	3		$ 1,245.00	$ 1,282.35						
PPE protective coverall for rodent work (M)	24	$ 470.00	11		$ 5,170.00	$ 5,325.10						
PPE protective coverall for rodent work (L)	24	$ 470.00	11	12	$ 5,170.00	$ 5,869.20						
N95 respirator for rodent work	80	$ 814.00	7		$ 2,198.00	$ 2,263.94						
Respirator fit test kit	1	$ 436.00	1		$ 436.00							
Safety glasses	10	$ 32.30	10		$ 323.00							
Nitrile gloves extended cuff XL	500	$ 332.50	2	1	$ 665.00	$ 684.95		$ 363.33				
Nitrile gloves extended cuff M	500	$ 332.50	3	1	$ 997.50	$ 1,027.43		$ 363.33				
Nitrile gloves extended cuff S	500	$ 332.50	1	2	$ 332.50	$ 342.48		$ 776.66				
2 gallon sharps bucket	20	$ 238.33	1	1	$ 238.33	$ 245.48		$ 260.43				
Biohazard bags	50	$ 38.13	1	1	$ 38.13	$ 39.27		$ 41.67				
Tablets (plus case)	1	$ 228.98	8	2	$ 1,831.84	$ 1,885.80		$ 500.43				
50 Tomahawk traps	1	$ 53.45	50	10	$ 3,172.50	$ 653.54		$ 693.34				
30 squirrel traps	1	$ 44.82	30	10	$ 1,544.60	$ 461.65						
20 rodent traps	1	$ 27.23	23	10	$ 626.29	$ 280.47						
Incentive for cattle owners	1	$ 7.00	600		$ 4,200.00	$ 4,326.00						
Incentive cookies/juice for participants	1	$ 2.00	400	900	$ 800.00	$ 824.00		$ 1,748.36				
Ear tag/tattoo kit		$ 398.00			$ 398.00							
Anesthesia for small mammals		$ 6,336.95			$ 7,168.48	$ 3,263.53						
Ethanol gallon	1	$ 82.00	1		$ 82.00							
Subtotal					$ 86,080.70	$ 54,713.88	$ 4,701.89	$ 22,208.54	$ 8,252.53			
Lab supplies for workshop					Y1	Y2	Y3	OY1	OY2	TOTAL		
Eppendorf tubes		$ 93.00	3				$ 279.00			$ 279.00		
ELISA plates		$ 138.40	2				$ 276.80			$ 276.80		
Filter pipette tip 200uL		$ 191.70	1				$ 191.70			$ 191.70		
Filter pipette tip 1000uL		$ 777.00	1				$ 227.00			$ 227.00		
Pipette tips 1000uL		$ 179.10	1				$ 129.10			$ 129.10		
Pipette tips 200uL		$ 79.00	2				$ 158.00					
Pipette tips 1000uL		$ 75.00	2				$ 152.00			$ 152.00		
Shipping and handling							$ 105.59					
SubTotal					$ -	$ -	$ 1,519	$ -	$ -	$ 1,519		

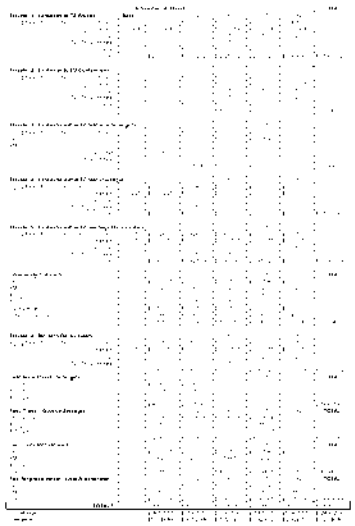
OVERALL

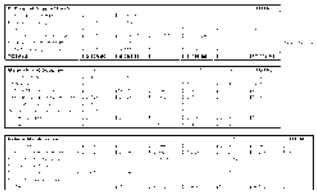
Breakdown for Justification	Y1	Y2	Y3	OY1	OY2
Field supplies	$ 39,528.06	$ 35,216.77	$ -	$ 10,973.92	$ -
Shipping	$ 15,033.00	$ 15,483.99	$ -	$ 5,475.65	$ -
Computers	$ 9,047.34	$ 2,569.12	$	$ 2,480.79	$ 4,876.00
Lab infrastructure/large items	$ 22,172.30	$	$	$	$
Supplies for Grad students	$ 1,500.00	$ 1,545.00	$ 3,182.70	$ 3,278.18	$ 3,376.53
Total	**$ 86,080.70**	**$ 54,713.88**	**$ 4,701.89**	**$ 22,208.54**	**$ 8,252.53**

Field supply breakdown	Y1	Y2	Y3	OY1	OY2
Sampling supplies	$ 8,227.89	$ 7,882.06	$ -	$ 8,276.37	$ -
PPE	$ 19,568.46	$ 19,737.84	$ -	$ 1,955.42	$ -
Incentive	$ 5,000.00	$ 5,150.00	$ -	$ 1,748.36	$ -
Tablets	$ 1,831.84	$ 1,885.80	$	$ 500.43	$
Trapping and	$ 9,709.87	$ 4,658.18	$	$ 093.34	$
Total	$ 79,528.06	$ 35,216.77	$	$ 10,973.92	$

Visa and Permit	Y1	Y2	Y3	Y4	Y5
COSTech application fee	50	50	50	50	50
COSTech clearance fee	300	300	300	300	300
Research fees (non-Tanzanian)	1800	1800	1800	1800	1800
TAWIRI Protected Area Permit	2000	2000			
Shipping samples			300	300	300
KCMC ethics approval	500				
NIMR - submit protocol	500				
NIMR - application fee	100				
NIMR - Expedited Review	1000				
NIMR - Renewal		100	100	100	100
NIMR - amendment	600	300		300	
Hummingbird IRB	2000	2000	2000	2000	2000
Cost per Person	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Rostal EHA	4150	4150	2150	2150	2150
Field Coordinator EHA	4150	4150	2150	2150	2150
Cleaveland UoG	0	2150	2150	2150	2150
Technician UoG	2150	2150	2150	2150	
Lankester SU	4150	4150	2150	2150	2150
Veterinarian WSU	50	50	0	0	0
Field Assistant WSU	50	50	0	50	0
PhD Student WSU	50	50	0	0	0
Masters' students EHA	0	50	100	100	50
Post-doctoral fellow	0	0	0	0	50







A. Senior/Key Personnel						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B. Other Personnel						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C. Equipment						
[illegible]						
D. Travel						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E. Participant/Trainee Support Costs						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F. Other Direct Costs						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G. Direct Costs and Non-Std Direct Costs						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
H. Indirect Costs						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
I. Total Direct and Indirect Costs						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
J. Fee						
Fee	$	$	$	$	$	$
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ 6,510.34	$ [illegible]	$ 5,983.30	$ [illegible]	$ [illegible]

Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Travel Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Total	[illegible]

Y1	Y2	Y3	OY1	OY2	Base
1	-	-	1	1	$ 30,406.00
12	12	6	3	3	$ 3,970.00

Travel					
	Y1	Y2	Y3	OY1	OY2
# trips	4	2	2	4	2
# days	4	2	2	4	2
Transport	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00
Per Diem	$ 68.00	$ 68.00	$ 68.00	$ 68.00	$ 68.00
Total	$ 936.00	$ 936.00	$ 936.00	$ 936.00	$ 936.00

Travel	Y1	Y2	Y3	OY1	OY2	Total
A. Senior/Key Personnel						
Principal Public Health Consultant Subject Matter Expert	$ 7,840.00	$ 7,616.00	$ 3,663.28	$ 3,531.25	$ 3,613.75	$ 26,264.28
Total Senior Key Personnel	$ 7,840.00	$ 7,616.00	$ 3,663.28	$ 3,531.25	$ 3,613.75	$ 26,264.28
B. Other Personnel						
Monthly Technical (SME) Support Retainer	$ 1,820.00	$ 1,820.00	$ -	$ -	$ -	$ 7,280.00
Total Other Personnel	$ 1,820.00	$ 1,820.00	$ -	$ -	$ -	$ 7,280.00
C. Equipment						
Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
D. Travel						
1. Domestic Travel	$ 936.00	$ 936.00	$ 936.00	$ 936.00	$ 936.00	$ 4,680.00
2. Foreign Travel	$ -	$ -	$ -	$ -	$ -	$ -
Total Travel	$ 936.00	$ 936.00	$ 936.00	$ 936.00	$ 936.00	$ 4,680.00
E. Participant/Trainee Support Costs						
1. Tuition Fees, Health Insurance	$ -	$ -	$ -	$ -	$ -	$ -
2. Stipends	$ -	$ -	$ -	$ -	$ -	$ -
3. Travel	$ -	$ -	$ -	$ -	$ -	$ -
4. Subsistence	$ -	$ -	$ -	$ -	$ -	$ -
5. Other	$ -	$ -	$ -	$ -	$ -	$ -
Total Participant Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials & Supplies						$ -
2. Publication Costs						$ -
3. Consultant Services (Salary $0.00/day, 0 days/year @)						$
4. ADP Computer Services						$
5. Subawards/Consortium/Contractual Costs						$
6. Equipment or Facility Rental/Use Fees						$ -
7. Advertisement/Announcing						$ -
8. Other						$ -
9. Other						$ -
10. Other						$ -
Total Other Direct Costs	$ -	$ -	$ -	$ -	$ -	$ -
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ 9,400.00	$ 9,484.00	$ 4,679.28	$ 4,338.82	$ 4,149.75	$ 32,052.84
Modified Direct Costs	$ 9,400.00	$ 9,484.00	$ 4,679.28	$ 4,338.82	$ 4,149.75	$ 32,052.84
H. Indirect Costs						
1. NIH IDC Rate	$ 940.00	$ 948.40	$ 467.93	$ 305.93	$ 314.99	$ 2,977.25
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct + Indirect	$ 7,840.00	$ 7,732.40	$ 3,267.28	$ 3,364.70	$ 3,464.75	$ 24,269.12
J. Fee						
Fee	$ -	$ -	$ -	$ -	$ -	$ -
K. Total Costs and Fee						
Total Costs	$ 7,840.00	$ 7,732.40	$ 3,267.28	$ 3,364.70	$ 3,464.75	$ 24,269.12

Y1	Y2	Y3	OY1	OY2	Base
0.17	0.17	0.17	2	2	$ 17,500.00
0.1	0.1	0.1	0.1	0.1	$ 7,734.00

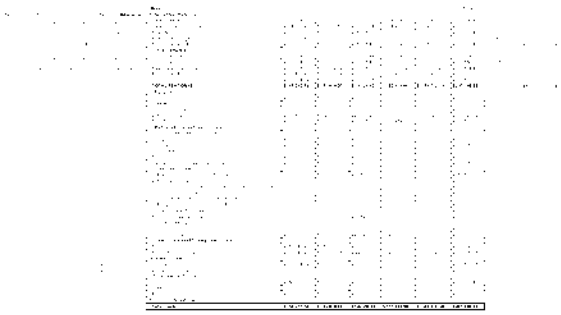
One Health Desk	Y1	Y2	Y3	OY1	OY2	Total
A. Senior/Key Personnel						
Dr. Jeremy Asselga, Molecular Epidemiologist	$ 249.00	$ 255.47	$ 261.13	$ 3,153.55	$ 3,264.23	$ 7,239.45
Dr. Ali Nabi Bernard, Public Health Specialist	$ 257.32	$ 265.51	$ 273.52	$ 3,306.69	$ 3,191.67	$ 7,097.36
Total Senior/Key Personnel	$ 505.32	$ 521.03	$ 536.65	$ 6,257.27	$ 6,455.20	$ 14,337.30
B. Other Personnel						
Total Other Personnel	$ -	$ -	$ -	$ -	$ -	$ -
C. Equipment						
Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
D. Travel						
1. Domestic Travel	$ 650.00	$ 670.30	$ 690.54	$ 852.64	$ 875.31	$ 1,805.49
2. Foreign Travel	$ -	$ -	$ -	$ -	$ -	$ 155,871.74
Total Travel	$ 650.00	$ 670.30	$ 690.54	$ 852.64	$ 875.31	$ 1,805.49
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$ -
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$ -
5. Other						$ -
Total Participant Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials And Supplies						$ -
2. Publication Costs						$ -
3. Consultant Services (Patient IDs, Hand Zs, Field Team Ops)						$ -
4. ADP Computer Services						$ -
5. Subawards Consortium/ Contractual Costs						$ -
6. Equipment or Facility Rental/ User Fees						$ -
7. Alterations and Renovations						$ -
8. Other (Primary, $2,500 p.a. & Yr $50/m Y1-3)						$ -
9. Other (Patient workweight)						$ -
10. Other (equipment maintenance)						$ -
Total Other Direct Costs	$ -	$ -	$ -	$ -	$ -	$ -
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ 1,165.66	$ 1,139.03	$ 1,173.20	$ 6,842.21	$ 7,161.31	$ 17,312.78
Modified Direct Costs	$ 1,165.66	$ 1,139.03	$ 1,173.20	$ 6,842.21	$ 7,161.31	$ 17,312.78
H. Indirect Costs						
1. OHDA TC Rate	$ 119.26	$ 113.90	$ 117.32	$ 684.72	$ 715.15	$ 1,751.29
2. Indirect Cost Rate						$ -
I. Total Direct and Indirect Costs						
Direct + Indirect	$ 1,218.44	$ 1,252.93	$ 1,290.52	$ 7,527.93	$ 7,876.46	$ 19,064.07
J. Fee						
Fee	$ -	$ -	$ -	$ -	$ -	$ -
K. Total Costs and Fee						
Total Costs	$ 1,218.44	$ 1,252.93	$ 1,290.52	$ 7,527.93	$ 7,876.46	$ 19,064.07

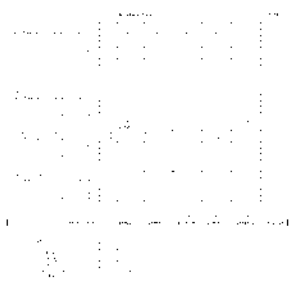
TRave					
	Y1	Y2	Y3	Y4	Y5
# of PI S	1	1	1	1	1
# of Nur	2	2	2	2	2
Transport	$ 2,400.00	$ 2,467.20	$ 2,535.70	$ 2,606.55	$ 2,679.80
Per Diem	$ 5,400.00	$ 5,551.20	$ 5,706.30	$ 5,865.45	$ 6,028.80
Total	$ 650.00	$ 670.30	$ 690.54	$ 852.64	$ 875.31

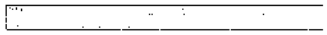
Y1	Y2	Y3	OY1	OY2	Base	PHE	Y1	Y2	Y3	OY1	OY2	Total
0	0	0	0	0.1	$ 127,407.00	Dr Roger Fowler, Virologist	$ -	$ -	$ -	$ -	$ 1,138.17	$ 1,138.17
						Total Senior/Key Personnel	$ -	$ -	$ -	$ -	$ 1,138.17	$ 1,138.17
						B. Other Personnel						$ -
0	0	0	0	1.375	$ 67,141.00	Dr Stuart Dowall, Virologist	$ -	$ -	$ -	$ -	$ 9,784.18	$ 9,784.18
0	0	0	0	0.05	$ 85,201.00	Ms McLeod, Project Manager	$ -	$ -	$ -	$ -	$ 358.25	$ 358.25
0	0	0	0	1.2	$ 77,102.00	Kevin Richards, Technician	$ -	$ -	$ -	$ -	$ 7,737.76	$ 7,737.76
0	0	0	0	1.2	$ 68,881.00	James Person, Technician	$ -	$ -	$ -	$ -	$ 6,888.10	$ 6,888.10
						Total Other Personnel	$ -	$ -	$ -	$ -	$ 24,288.57	$ 24,288.57
						C. Equipment						
						Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
						D. Travel						
						1. Domestic Travel	-	-	-	-	-	$ -
						2. Foreign Travel					$ 1,850.00	$ 1,850.00
						Total Travel	$ -	$ -	$ -	$ -	$ 1,850.00	$ 1,850.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance	$ -	$ -	$ -	$ -	$ -	$ -
						2. Stipends	$ -	$ -	$ -	$ -	$ -	$ -
						3. Travel	$ -	$ -	$ -	$ -	$ -	$ -
						4. Subsistance	$ -	$ -	$ -	$ -	$ -	$ -
						5. Other	$ -	$ -	$ -	$ -	$ -	$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	-	-	-	-	-	$ -
						2. Publication Costs						$ -
						3. Consultant Services (Rodent ID Kit, Input 2x Rapid Tests $9)	-	-	-	-	-	$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees	-	-	-	-	$ 7,676.00	$ 7,676.00
						7. Alterations and Renovations						$ -
						8. Other (Testing)	-	-	-	-	$ 4,630.00	$ 4,630.00
						9. Other (shipping samples)					$ 1,267.00	$ 1,267.00
						10. Other (rental car 4 years)					$ 1,771.00	$ 1,771.00
						Total Other Direct Costs	$ -	$ -	$ -	$ -	$ 14,174.00	$ 14,174.00
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ -	$ -	$ -	$ -	$ 41,532.75	$ 41,532.75
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate-->	37.8%		1. PHE IDC Rate	$ -	$ -	$ -	$ -	$ 15,699.93	$ 15,699.93
			IDC Rate -->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ -	$ -	$ -	$ -	$ 57,232.68	$ 57,232.68
						J. Fee						
						Fee	$ -	$ -	$ -	$ -	$ -	$ -
						K. Total Costs and Fee						
						Total Costs	$ -	$ -	$ -	$ -	$ 57,232.68	$ 57,232.68

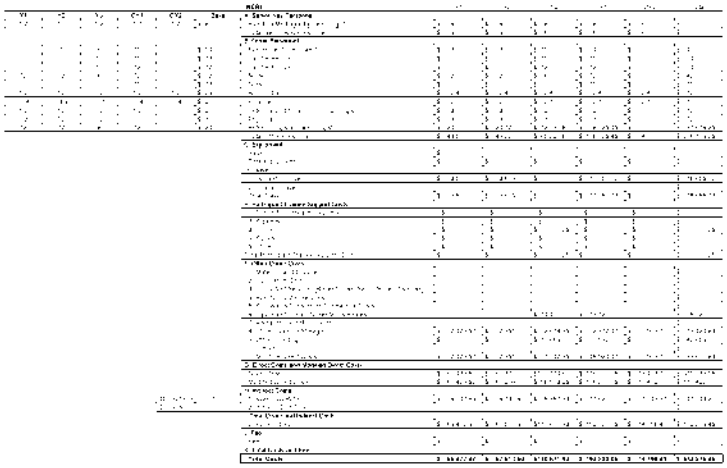
Travel			
Flight	$ 1,000.00	1	$ 1,000.00
Per Diem	$ 313.00	3	$ 938.00
Total			$ 1,938.00

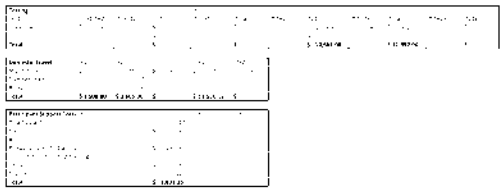
Materials and Supplies			
Cost of Test	$ 45.00	100	$ 4,500.00
Life Vest	$ 3,788.00	2	$ 7,576.00
			$12,206.00











One Health Coordination Desk (OHCD-PMO) Budget Justification

A. Senior Personnel

We request a total of S14, to support Key Personnel over the five years of the proposed project.

Dr. Justine Assenga, Research Scientist, Molecular Epidemiologist, will commit 0 months per year for which we request salary support of $2 in Year 1, with a 3% increase per annum (p.a.). Dr. Justine Assenga is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk and will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Assenga's time will increase in Y for a total of $7,2 over the five years of the project.

Dr. Jubilate Bernard, Research Scientist, Public Health Specialist, will commit 0 months per year for which we request salary support of $25 in Year 1, with a 3% increase p.a. Dr. Jubilate Bernard is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Bernard's time will increase to months per year in - for a total of S7, over the five years of the project.

D. Travel

We request a total of S3,185 to support local travel for them in Tanzania over the five years of the proposed project.

We request $600 in Y1 so that both Dr. Assenga and Dr. Bernard may attend project meetings held in Tanzania and take other meetings to improve One Health stakeholder relationships.

Travel expenses will increase at a rate of 3% per year over the five years of the project.

H. Indirect Costs

We request a total of S , 5 in overhead over the five years of the project. The rate of overhead will be 10% each year, starting with S11 in Y1.

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EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4489 (direct)
1.212.380.4465 (fax)
www.ecohealthalliance.org <http://www.ecohealthalliance.org/>

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EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics.

On Dec 16, 2019, at 2:24 PM, (b)(6) (b)(6) > wrote:

Thanks for following up because I did not receive that email on the 5th. I have checked all my folders and nothing comes up.

Can you please send it again and I will confirm as soon as I receive it.

-----Original Message-----
From: Dr. Melinda Rostal <rostal@ecohealthalliance.org <mailto:rostal@ecohealthalliance.org> >
Sent: Monday, December 16, 2019 2:19 PM
To: (b)(6) (b)(6) >; Gawrelski, Emalee CIV DTRA ACQ AND LOG (USA) <emalee.gawrelski.civ@mail.mil <mailto:emalee.gawrelski.civ@mail.mil> >
Cc: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> >; Joe Riccardi <riccardi@ecohealthalliance.org <mailto:riccardi@ecohealthalliance.org> >; Amanda Andre <amanda.andre@ecohealthalliance.org <mailto:amanda.andre@ecohealthalliance.org> >; Whitney Bagge <bagge@ecohealthalliance.org <mailto:bagge@ecohealthalliance.org> >
Subject: [Non-DoD Source] Re: FRBAA14-6-2-0356 Clarification Questions

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I just wanted to confirm that you had received the documentation that I sent to you on December 5.

Kind regards,
Mindy

Melinda Rostal DVM, MPH
Principal Scientist, Vector-Borne Diseases

Rift Valley Fever Virus Project Manager

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4489 (direct)
1.212.380.4465 (fax)
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On Dec 5, 2019, at 10:50 PM, Dr. Melinda Rostal <rostal@ecohealthalliance.org <mailto:rostal@ecohealthalliance.org> < Caution-mailto:rostal@ecohealthalliance.org > > wrote:

Dear (b)(6)

Please find attached the documentation requested for our FRBAA14-6-2-0356 cost proposal. We have responded to the clarification questions and indicated both the document and page number where the full documentation/justification may be viewed. For each partner we have provided two files:

(a) a PDF document of our updated justification using tracked changes according the the current costs for all items based on the documentation
(b) a PDF of the documentation that was requested on the clarification sheet

We have also included an Excel spreadsheet that includes our calculations for all costs and all partners corresponding to our updated justifications and documentation. Necessarily and following the documentation now provided, various costs have changed since our initial submission in April 2018 and our budget has been updated accordingly. Therefore, our overall budget request has also increased to $4,995,106.37 with annual amounts as follows.

Y1: $999,888.16
Y2: $997,047.51
Y3: $999,782.70
OY1: $998,704.80
OY2: $999,683.19.

Please email anytime or contact me directly at +1.651.308.5498 with any questions about our documentation, cost proposal, or other details.

Best,

Mindy

<FRBAA14-6-2-0356_Clarifications.xlsx>
<FRBAA14-6-2-0356 Detailed Budget.xlsx>
<01 - FRBAA14-6-2-0356 - EHA Budget Justification.pdf>
<01 - FRBAA14-6-2-0356 - EHA Documentation.pdf>
<02 - FRBAA14-6-2-0356 - KCRI _Budget Justification.pdf>
<02 - FRBAA14-6-2-0356 - KCRI Documentation.pdf>
<03 - FRBAA14-6-2-0356 - OHCD PMO Documentation.pdf>
<03 - FRBAA14-6-2-0356 - OHCD PMO_Budget Justification.pdf>
<04 - FRBAA14-6-2-0356 - PHE Documentation.pdf>
<04 - FRBAA14-6-2-0356 - PHE_Budget Justification.pdf>
<05 - FRBAA14-6-2-0356 - TAWIRI Budget Justification.pdf>
<05 - FRBAA14-6-2-0356 - TAWIRI Documentation.pdf>
<06 - FRBAA14-6-2-0356 - TVLA Budget Justification.pdf>
<06 - FRBAA14-6-2-0356 - TVLA Documentation.pdf>
<07 - FRBAA14-6-2-0356 - UoG Budget Justification.pdf>
<07 - FRBAA14-6-2-0356 - UoG Documentation.pdf>
<08 - FRBAA14-6-2-0356 - WSU Budget Justification.pdf>
<08 - FRBAA14-6-2-0356 - WSU Documentation.pdf>

Melinda Rostal DVM, MPH
Senior Research Scientist

PREDICT 2 Surveillance Coordinator for EcoHealth Alliance

Rift Valley Fever Virus Project Manager

EcoHealth Alliance
460 West 34th Street, Suite 1701
New York, NY 10001

1.212.380.4489 (direct)
Caution-www.ecohealthalliance.org <http://Caution-www.ecohealthalliance.org> <
Caution-http://www.ecohealthalliance.org/ >

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EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

On Oct 29, 2019, at 10:45 AM (b)(6) (b)(6) wrote:

Good Morning,

We have reviewed your cost proposal and are requesting responses to the attached clarification questions.

Please provide responses as soon as possible so that we can move forward with grant award. Please let me know if you have any questions.

V/r

(b)(6) Contractor

Contract Specialist ▪ TENICA

Defense Threat Reduction Agency (DTRA)

Office Phone: (b)(6)

(b)(6)

Caution (b)(6)

<FRBAA14-6-2-0356_Clarifications.xlsx>

From: Joe Riccardi
To: (b)(6)
Cc: Aleksei Chmura
Subject: Re: [Non-DoD Source] Re: Available for Quick Call?
Date: Thursday, June 11, 2020 12:28:42 PM

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Good Afternoon,

We would prefer Monthly invoicing if that is alright.

Cheers

Joe

On Thu, Jun 11, 2020 at 12:26 PM (b)(6)
Caution (b)(6) > > wrote:

> Good Afternoon,
>
> Just a quick question, is there a particular way you want the invoice set? Monthly, quarterly, etc?
>
> -----Original Message-----
> From: Joe Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > >
> Sent: Monday, June 8, 2020 1:14 PM
> To: (b)(6)
> Caution (b)(6)
> Cc: Aleksei Chmura <chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > >
> Subject: [Non-DoD Source] Re: Available for Quick Call?
>
> All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.
>
> ---
>
> Good Afternoon (b)(6)
>
> I just wanted to follow up from our phone call the other week to check in on the status of the CCHF award and if you needed anything more from us?
>
> Cheers
>
> Joe

On Tue, May 26, 2020 at 11:48 AM Joe Riccardi <riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > > wrote:

Hi (b)(6)

Melinda had reached over the weekend asking me to give you a quick call about our CCHF award?

Please let me know when is best for you? Or if easier my number is (b)(6)

Cheers

Joe

--

Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
460 West 34th Street – 17th floor
New York, NY 10001

1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org/ < Caution-http://www.ecohealthalliance.org/ > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

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Joseph Riccardi
Manager of Budget and Finance

EcoHealth Alliance
520 Eighth Avenue
Suite 1201
New York, NY 10018

1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org/ < Caution-http://www.ecohealthalliance.org/ > >

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1.212.380.4494 (direct)

(b)(6) (mobile)

1.212.380.4465 (fax)

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

Cover Sheet

Proposal Number	FRBAA14-6-2-0356
Phase I Proposal Number	FRBAA14-6-1-0867
Topic	Thrust Area 6
Proposal Title	Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 W 34th St Suite 1701
Tax ID	311726494	**City**	New York
DUNS	0770900660000	**State/Province**	NY
CAGE		**Zip**	10001 - 2302
Website		**Country**	USA
POC Name	Dr. Melinda Rostal	**POC Email**	rostal@ecohealthalliance.org

Cost

Applicant Certification

Organization Type	Non-Profit Organization
Are Human Subjects involved?	**No**
Are Vertebrate Animals involved?	**No**
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	**No**

Agency 1	**Contract/Grant No.**
Agency 2	**Contract/Grant No.**
Agency 3	**Contract/Grant No.**

Are you a current DoD Contractor or Grantee?	**No**
Agency	**Point Of Contact**
Phone #	

Principal Investigator 1

Business Official 1

Prefix	Dr.
Name	Melinda Rostal
Title	Senior Research Scientist
Address 1	460 W 34th St
Address 2	17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2302
Phone	2123804460 Ext :
Fax	2123804465
Email	rostal@ecohealthalliance.org

Prefix	Dr.
Name	Aleksei Chmura
Title	Authorized Organizational Representative
Address 1	460 W 34th St.
Address 2	17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2302
Phone	2123804460 Ext :
Fax	2123804465
Email	chmura@ecohealthalliance.org

Proprietary Information (list page numbers)

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project.

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

"This publicly releasable abstract is provided to DTRA for use in fulfillment of Section 8123 of the Defense Appropriations Act and future versions of the same." Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania Crimean-Congo hemorrhagic fever (CCHF) is a deadly disease caused by a virus that is spread through a tick bite. The World Health Organization and U.S. Department of Health and Human Services consider CCHF to be a severe threat to human health with epidemic potential, for which there is an urgent need for accelerated research, especially as there is no known treatment. CCHF virus (CCHFV) occurs from South Africa to northern Europe and east into Central Asia, including countries such as Afghanistan and Iraq where U.S. troops are stationed and potentially at risk for infection. Like Ebola virus in West Africa, CCHFV has been known to circulate silently in livestock and wildlife for decades with no cases in people reported before causing massive outbreaks (affecting more than a thousand people in Turkey) that are further spread through human-to-human transmission. These "surprise" outbreaks are often linked to people making changes to the environment that allow the ticks and the small wild mammals they feed on to increase in abundance. We propose to conduct the first investigation into the patterns and rates of CCHFV infection in people in northern Tanzania to reduce the threat of disease. While CCHFV is spread by ticks to people, the virus

does infect (though does not make sick) livestock and small wild mammals and if people contact the blood of infected animals they can also become infected. Therefore, to understand the risk of infection in people in this region we need to take a One Health approach and investigate CCHFV infection patterns in cattle and wildlife and identify environmental factors that are associated with higher rates of CCHFV infection. While there is evidence that CCHF is circulating in animals in Tanzania and neighboring Uganda has had 6 outbreaks of CCHF since 2010, CCHF is not routinely tested for in Tanzania. This will be the first study to evaluate the risk of an outbreak in Tanzania. To maximize the impact of the project, we will work closely with our partners in the Government of Tanzania to develop policy recommendations to reduce the risk of CCHFV infection in people living where the ticks are present as well as to reduce the risk of a case snow-balling into an epidemic. We will establish sustainable diagnostic capacity at regional health laboratories in northern Tanzania. This collaboration will also support communication between animal and human health officials, which is important not only for CCHF, but also for the many other zoonotic diseases (diseases that spread from animals to people) that threaten people. This project strives to collaborate with the Government of Tanzania to assess and understand the risk of CCHF epidemics while at the same time producing sound policy recommendations that will reduce the threat that CCHF poses for the people in Tanzania and those traveling through Tanzania.

Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania
Phase II Technical Proposal

I. ABSTRACT. In line with Thrust Area 6 - Cooperative Counter Weapons of Mass Destruction Research with Global Partners FRCWMD we propose to reduce the threat of Crimean-Congo hemorrhagic fever (CCHF) by conducting the first collaborative One Health investigation of the ecology and epidemiology of CCHF virus (CCHFV) in Tanzania. Through hypothesis driven research we will evaluate: 1) the current seroprevalence of CCHFV in people, cattle and wildlife; 2) ecological factors (e.g. environmental disturbance) associated with CCHFV vector abundance and seroprevalence in the three groups; and 3) risk factors associated with CCHFV incidence in human populations. Understanding CCHFV ecology in Tanzania is critical to improving Tanzania's capacity to evaluate and manage the risk of CCHF and reduce the threat to people, including Americans working or traveling in the country.

II. SCOPE.

A. OBJECTIVE. We will establish a multi-disciplinary team of Tanzanian and international One Health experts to collect fundamental data on CCHFV, conduct rigorous scientific analyses and support the Government of Tanzania in the development of policies to prevent CCHF outbreaks. We will use a One Health approach to investigate the following three hypotheses: **1) CCHFV is circulating in ticks, livestock and wildlife in Tanzania; 2) CCHFV is present and circulating in the human population in Tanzania; 3) CCHFV prevalence, seroprevalence and vector abundance will vary across an environmental disturbance gradient from peri-urban communities, to pastoral rangeland to protected wildlife areas.** The project will support the **capacity of Tanzanian human and animal health laboratories to conduct CCHFV diagnostics, train Tanzanian field researchers** and provide valuable data to Tanzanian government partners and stakeholders to **develop policies to prepare for and reduce the threat of CCHF.**

B. BACKGROUND. Crimean-Congo hemorrhagic fever is a **WHO Blueprint R&D priority disease** for which **there is an urgent need for accelerated research** given the **epidemic potential and lack of countermeasures against CCHFV**[1]. The Department of Health and Human Services reports that CCHF has the potential to pose a **severe threat to human health**. Similarly, **Tanzania identified viral hemorrhagic fevers as one of six priority zoonoses of greatest national concern**[2]. CCHFV is thought to be transmitted primarily by *Hyalomma* spp. ticks and occurs throughout the ticks' range, from South Africa to northern Europe[3]. CCHFV was first identified in Crimea, after an **epidemic in more than 200 troops**[4]. People may be infected with CCHFV through the bite of an infected tick or via direct contact with fluids from an infected animal or human[5]. Clinical signs include fever, headache, hemorrhagic disease and death in 30-40% of patients[4-6]. Human-to-human transmission is possible, and if isolation practices are not implemented, nosocomial outbreaks can occur[7].

While CCHFV is not known to cause disease in any animal species[3], **a One Health approach is necessary to understand the ecology of CCHFV** and thereby better estimate the potential for infection in people. *Hyalomma* spp. ticks are capable of transstadial, transovarial, sexual, and co-feeding transmission of CCHFV[8]. *Hyalomma* spp. ticks feed preferentially on small mammals or birds during the larval/nymph stage and on large animals (livestock/antelope) and humans during the adult stage[9].

Serological evidence of CCHFV circulation in a country highlights the potential for outbreaks, even where human cases have not yet been reported[10]. In Turkey, for example, CCHFV antibodies were detected as far back as 1980[11], but no cases were reported until an outbreak of 1,103 cases occurred in 2002-06[12]. This "sudden" appearance of CCHF has been described in many regions that thereafter remain endemic for the virus, including Pakistan, Crimea and Turkey[3,12]. This phenomenon has also been described for other hemorrhagic fever, including the Ebola outbreak in West Africa in 2014-16[13].

Human epidemics have often been linked to environmental and social changes, which are associated with an increase in the abundance of CCHFV vectors. These drivers include: climatic changes, abandoned agricultural lands, wartime activities, introduction of a susceptible human population, changing pasture patterns, and converting floodplains to farmland[3].

Although Tanzania is listed by the WHO as a having CCHFV virological or serological evidence and vector presence[14], little is known about the current status of CCHFV in Tanzania with the most recent cattle serosurvey conducted in 1974-75 (identifying a 9% seroprevalence)[3]. Furthermore, despite two recent modeling studies that predicted northern Tanzania to be at high risk for CCHFV[15,16] and neighboring Uganda reporting multiple cases since 2016[17], CCHF has not yet been investigated in people in Tanzania. Given that anthropogenic environmental changes can lead to large CCHF outbreaks and that environmental and land use changes are occurring rapidly in Tanzania, it is important and timely to generate a better understanding of CCHFV ecology. **We theorize that CCHFV is causing human infections in Tanzania and that the risk of CCHFV infection in people is being modified by current and ongoing environmental changes. This One Health project will provide critical data and analyses to support policy development for reducing the threat of CCHF.** We will do this through four activities aligned with the project's scientific hypotheses and tasks:

1) Characterize differences in CCHFV seroprevalence in animals and humans, abundance of CCHFV vectors, and CCHFV prevalence across a gradient of environmental disturbance.
2) Characterize the exposure, behavioral risk and incidence of CCHFV in human populations.
3) Identify environmental factors associated with higher levels of CCHFV seroprevalence, incidence, and presence as well as with higher abundance of CCHFV vectors.
4) Develop policy recommendations to reduce the risk of CCHF epidemics in Tanzania.

Study Sites: We propose to conduct this work in Tanzania. The serological evidence of CCHFV infection in livestock[3] (see preliminary data) and the proximity of diagnosed cases of CCHF in Uganda[17] and Kenya[18] indicate that it is probable that CCHFV is present in Tanzania. The Government of Tanzania has prioritized hemorrhagic fevers[2] and predictive modeling studies have identified northern Tanzania as being at high risk for CCHF[15,16]. **We have a strong history of conducting research in Tanzania and have an established network of collaborators and partners therein** (see Credentials). The study site will be in the Arusha Region of northern Tanzania and

Figure 1. The proposed study area in Northern Tanzania, from just east of Arusha, west to the Serengeti National Park and north to the border with Kenya. The human disturbance index identifies high disturbance around Arusha and East of it, with the least disturbance occurring in the protected areas.

will stretch from the town of Arusha, the third largest city in Tanzania, westwards to the Serengeti National Park and northwards to the international border with Kenya (see Figure 1). This study site will allow investigation across three levels of environmental disturbance: peri-urban areas, pastoral livestock areas, and natural protected areas.

Research Justification: In Tanzania, the most recent investigation of CCHFV was conducted in 1975 and was limited to livestock serology[3]. To compile contemporary preliminary data, we assayed 276 cattle, goat and sheep samples collected from the study area using the newly released ID Screen® CCHF Double Antigen Multi-species ELISA by IDVet (Grabels, France). **We detected anti-CCHFV antibodies in 41% of cattle, 30% of goats and 25% sheep from Tanzania (see Table 1).** In neighboring Uganda, prior to the launch of a viral hemorrhagic fever surveillance program in 2010, the most recent cases of CCHF were reported in 1972[3]. Following the launch of the surveillance program, six outbreaks of CCHF (2013, 2015 and 2017) have been detected[17]. The first case of CCHF in Kenya was reported in 2000[18]. Isolated cases can snowball into an epidemic in rural health centers[19]. **Without baseline data to identify patterns of CCHFV exposure in human populations, health care workers, facilities and government agencies cannot prepare for and take measures to reduce the threat of CCHF.** We will use a One Health approach to collect samples from humans, livestock, wildlife and ticks from the same locations and during the same sampling trip. This method will increase the power of our analysis to detect associations between human and animal seroprevalences[20].

Table 1. Preliminary data screening 92 of each cattle, goats and sheep with the multispecies ELISA for CCHFV antibodies. Samples were collected from animals within part of the proposed study area in Tanzania through co-PI Cleaveland's previous work on the Social, Economic and Environmental Drivers of Zoonoses in Tanzania (SEEDZ) project during 2016.

Species	Number Tested	Number Positive	Percent Positive	Confidence Interval
Cattle	92	38	41%	32-52%
Goats	92	28	30%	17-35%
Sheep	92	23	25%	22-40%

CCHF outbreaks have been linked to environmental changes, specifically those that increase the abundance of small mammal hosts. **In tropical areas anthropogenic environmental changes occur on a rapid timescale and affect large regions. These anthropogenic drivers have been linked to outbreaks of various hemorrhagic viruses, including CCHF**[21] and to changing community structure among small mammals[22]. Shifts in small mammal communities following anthropogenic changes are associated with large and protracted CCHF outbreaks (e.g. Turkey[12]). Studies have identified environmental factors, such as increasing temperature, normalized difference vegetation index (NDVI), and **savannah-type habitat as being associated with more human CCHF cases**[23]. Few studies have investigated how intermediate changes in environmental disturbance may impact the risk of CCHF as measured by the direct prevalence of CCHFV and vector abundance. Therefore, we **propose to compare three levels of anthropogenic disturbance by characterizing the epidemiology of CCHFV in peri-urban, pastoral rangeland, and protected savanna areas in northern Tanzania.** These vital data can be used to predict future changes in CCHFV prevalence given continued environmental disturbance that supports specific communities of small mammals. In OY2 we propose to include **remote-sensing data to identify other important ecological factors associated with viral and vector prevalence as well as seroprevalence**.

In East Africa, surveys in people have identified seroprevalences of 2.2% in Uganda[24] and 14% and 23% in two areas in Kenya[25]. **Few incidence studies have been conducted**, and those have only identified cases retrospectively using hospital records[23]. As **the proportion of people infected with CCHFV that become symptomatic is unknown** (one model estimated 22% of people exposed to CCHFV become ill[26]), and to better **understand the potential for a CCHF outbreak in Tanzania, we propose to prospectively resample participants within 2 years of our initial serosurvey to estimate the incidence of CCHFV seroconversion**, giving us a more accurate estimate of true incidence.

C. PROGRAMMATICS. We established a collaborative team of Tanzanian, U.S. and U.K. partners to implement the proposed project. We demonstrated the functionality of our team by generating preliminary CCHFV serology results from Tanzanian livestock samples. PI Rostal has worked for over a decade with bunyavirales, including a previous project on CCHFV[27]. PI Rostal and co-PI Cleaveland first collaborated in 2005 and in 2019 PI Rostal will complete her Ph.D. in epidemiology under the supervision of co-PI Cleaveland at the University of Glasgow. Co-PIs Cleaveland, Lankester, Mmbaga and Key Personnel (KP) Keyyu have co-authored publications together[28,29] and KP Hewson has authored over 30 publications on CCHFV[30-32].

As the prime institution, EcoHealth Alliance (EHA) will coordinate the collaboration between all parts of the project (livestock, wildlife, and tick studies and laboratory and ecological results) as well as analyses and publications. EHA will also mentor the post-doctoral fellow and be responsible for all contractual obligations with DTRA. This One Health investigation into the ecology and epidemiology of CCHFV will be led by experts from: Kilimanjaro Clinical Research Institute (KCRI), Tanzanian Veterinary Laboratory Agency (TVLA), Global Animal Health Tanzania (GAHT), Tanzania Wildlife Research Institute (TAWIRI), One Health Coordination Desk-Prime Minister's Office (OHCD-PMO), University of Glasgow (UoG), Washington State University (WSU), and Public Health England (PHE).

Table 2: Partners and roles.

Institution	Activities	Personnel	Degrees	Role
EcoHealth Alliance (prime)	Management; delivery; training; study design; sample/data collection; analyses. As the prime, EHA will finalize and implement the study design, ensure coordination between all parts of the project (livestock, human, tick, environmental and wildlife studies, and policy development) and analyze and publish the data collaboratively. EHA will be responsible for all contractual obligations with DTRA.	Melinda K. Rostal William B. Karesh Carlos Zambrana-Torrelio	M.P.H., D.V.M. D.V.M. Ph.D.	Principal Investigator Co-PI, Veterinarian Research Scientist, Ecologist
KCRI	Laboratory analysis (human samples); human field study design, implementation and analysis; training; mentorship; development of policy recommendations; communication with stakeholders.	Blandina Mmbaga Venance Maro	M.D., M.med., Ph.D. M.D., M.med.	Co-PI, Epidemiologist Research Scientist, Clinician
UoG	Epidemiological study design and analysis; laboratory planning, support, and training; development of policy recommendations;	Sarah Cleaveland Brian Willett	Vet.M.B. Ph.D. Ph.D.	Co-PI, Epidemiologist

	mentorship; communication with stakeholders.			Research Scientist, Viral Immunologist
TVLA	Laboratory testing (animals and ticks); animal study design, implementation and analysis; communication with stakeholders.	Furaha Mramba	M.Sc., Ph.D.	Co-PI, Entomologist
WSU	Epidemiological study design, implementation and analysis; development of policy recommendations; mentorship; communication with stakeholders.	Felix Lankester	B.V.Sc., M.Sc., Ph.D.	Co-PI, Veterinary Epidemiologist
GAHT	Field coordination and management; animal epidemiological study design, implementation and analysis; communication with stakeholders.	Felix Lankester	B.V.Sc., M.Sc., Ph.D.	Co-PI Veterinary Epidemiologist
TAWIRI	Support wildlife sampling team; animal epidemiological study design, implementation and analysis; communication with stakeholders.	Julius Keyyu	B.V.M., M.V.M., Ph.D.	Research Scientist, Disease Ecologist
OHCD-PMO	Develop the epidemiological plan; lead policy workshop; development of policy recommendations; mentorship; communication with stakeholders.	Justine Assenga Jubilate Bernard	B.V.M. M.V.M. Ph.D. M.P.H.	Research Scientist, Molecular Epidemiologist Research Scientist, Public Health Specialist
PHE	Confirm wildlife serology results with virus neutralization testing.	Roger Hewson	Ph.D.	Research Scientist, Virologist

D. RELEVANCE. This project seeks to characterize the epidemiology and ecology of CCHFV in the context of **evaluating CCHF as a public health threat in Tanzania and improving Tanzania's ability to respond to and reduce the risk of a CCHF epidemic**. It is critical to support this capability in countries where there is evidence that CCHFV is circulating, especially as development will continue to lead to rapid environmental changes that could drive the emergence of CCHF epidemics. **We will answer important questions regarding the epidemiology of the virus in people, cattle and wildlife** as well as how current environmental conditions in peri-urban, pastoral and protected areas impact the abundance and prevalence of *Hyalomma* spp. ticks and CCHFV, respectively. Finally, we will identify the key environmental drivers impacting CCHFV in Tanzania specifically.

CCHF is a public health threat requiring a One Health approach to disease mitigation. We have built an **integrated One Health team of researchers,** which includes several **Tanzanian government institutions that will directly use the outputs of this research to inform policy on CCHF prevention and control**. We will train Tanzanian scientists by supporting graduate students (or FETP fellows) and a Tanzanian post-doctoral fellow, as well as by hosting two workshops on CCHF diagnostics, a workshop on policy development, and a symposium to bring East Africa into focus for global experts and to support the flow of information and networks of CCHF researchers. **We will continue to be transparent and**

disseminate our results broadly in peer-reviewed journals and public venues. We will report all surveillance data to ministries responsible for health, livestock and environment in Tanzania. Results will also be disseminated via regular presentations that the PIs and KP give to the public, media, to governmental (USDA, NIH, USAID) and intergovernmental (WHO, FAO, OIE) agencies and scientific conferences, such as ASTMH, IMED, ASM Biothreats and the DTRA Annual Technical Review.

Scientific Impact for C-WMD science: CCHF is a threat frequently faced by U.S. warfighters working in endemic countries in Central Asia and the Middle East and war is considered to be a driver for the emergence of CCHF[4]. Though rarely tested for in East Africa, evidence is mounting that CCHF cases occur in people more frequently than previously thought. If CCHFV remains uninvestigated in Tanzania, it may continue to circulate undetected until an epidemic occurs, carrying the threat of transmission outside of Tanzania. Further, ever-changing environmental disturbances may drive a large CCHF outbreak. **This study will identify patterns of CCHFV seroprevalence in people, cattle and wildlife; measure the incidence of CCHFV infection in people as well as identify how different levels of environmental disturbance affect the prevalence of CCHFV vectors and the virus itself. By improving our understanding of the ecology of CCHFV in East Africa we are building the foundation to monitor for changes in prevalence, vectors and seroprevalence as the development drives environmental changes. Thereby reducing the threat of a CCHF large epidemic**, as occurred in Turkey[12]. We propose to collaborate directly with Tanzania's One Health Coordination Desk (Prime Minister's Office) to develop policies that can reduce the risk of CCHF outbreaks as well as prepare health care workers to use proper isolation precautions should a suspected case present at a health center.

III. CREDENTIALS.

PI: Dr. Melinda Rostal is a Senior Research Scientist at EcoHealth Alliance. Currently, Dr. Rostal is a co-PI and project manager for the DTRA-funded Understanding Rift Valley Fever (RVF) in the Republic of South Africa and the EHA surveillance coordinator for the USAID Emerging Pandemic Threats PREDICT-2 program, a $130 million effort focused on predicting and preventing pandemic diseases. She has developed, coordinated and managed projects and programs in 16 countries, including efforts to minimize the impact of diseases such as RVF and avian influenza, and supporting global emerging infectious disease surveillance systems.

Prime Organization: EcoHealth Alliance is a science-based organization incorporated over 45 years ago, currently working with local partners in over 20 countries at the nexus of public health, biodiversity conservation and international development. EHA has a staff of 50 in New York, including science (modelers, economists, social scientists, veterinarians and ecologists), administrative and communications staff. EHA has an extensive record of publishing high quality, peer-reviewed papers, journals, briefing documents and reports, including work on vector-borne viruses such as RVF[20,33,34] and West Nile[35,36]. EHA's demonstrated multi-disciplinary expertise in producing highly utilized and understandable science-based outputs will contribute significantly to achieving project goals and provide objective methods for tracking utilization of project findings.

Partners:

Kilimanjaro Clinical Research Institute is located in Moshi, Tanzania and provides necessary research infrastructure and logistics for infectious disease projects. The KCRI Zoonoses

Laboratory Unit has a unique infrastructure to support training and conduct diagnostic assays, including molecular diagnostics. The site serves as a Training Node for the Eastern African Consortium for Clinical Research. KCRI will conduct CCHFV ELISAs in BSL-2 laboratories.

Tanzanian Veterinary Laboratory Agency is headquartered in Dar es Salaam and delivers laboratory services to 11 centers located across Tanzania. TVLA is mandated to undertake research, diagnosis and investigation of animal diseases and vectors. TVLA will support its Arusha Centre to conduct the CCHFV serological tests and PCR in BSL-2 laboratories.

University of Glasgow has a well-established One Health and infectious disease research program involving Tanzanian collaborators from human, livestock and wildlife health sectors. The MRC-UoG Centre for Virus Research (CVR) houses an excellent infrastructure and equipment for molecular biology and virology. These include a category 3 high-containment suite and insectaries, automatic robotic systems for high throughput assays and qPCR machines.

Washington State University will support the proposed research by leveraging existing WSU research facilities, capacity, and scientific personnel in the U.S. and in Tanzania. The Paul G. Allen School for Global Animal Health, College of Veterinary Medicine is legally registered to conduct research in Tanzania and maintains an office in Arusha to support WSU investigators with local procurement, accounting, research permitting, and logistics.

Global Animal Health Tanzania is a non-governmental organization registered in Tanzania to facilitate infectious disease field research. GAHT's office space in Arusha has sufficient storage space for field equipment, GAHT also coordinates the use of four field vehicles with internal mobile refrigerators to transport temperature sensitive items.

Tanzania Wildlife Research Institute is a government institution mandated to conduct, coordinate and oversee wildlife research in Tanzania. TAWIRI investigates wildlife diseases and zoonoses. TAWIRI will provide expertise in small mammal sampling as well as provide access to banked samples from wild ruminants.

One Health Coordination Desk is housed in the Prime Minister's Office. The OHCD collaborates on the prioritization of zoonotic diseases; the creation of surveillance guidelines for priority zoonotic diseases; the development and review of control strategies for selected diseases in Tanzania; and the implementation of the national response to rabies and anthrax.

Public Health England-Porton Down has extensive experience in applied microbiology including access to a BSL-4 facility. The institute has over 40 years of experience in CCHF virology including the original isolation and characterization of Congo virus in 1958 and more recent studies involving CCHFV molecular epidemiology, disease modelling and vaccines.

WORK TO BE PERFORMED.

A. <u>GENERAL</u>. By the end of the project period and two option years we propose to have completed a synthesis of ecological and host factors that impact the ecology and epidemiology of CCHFV in Tanzania, improved the capacity of regional laboratories in Tanzania to detect and diagnose CCHFV, collaboratively developed policy recommendations to reduce the threat of CCHF in Tanzania and raised the awareness of the emerging issue of CCHF in East Africa through a symposium designed to bring together global leaders in CCHFV epidemiology with regional African public health specialists and researchers. Our collaboration of multi-disciplinary scientists will successfully execute a One Health investigation of CCHFV in Tanzania. We will investigate patterns of CCHFV seroprevalence in people, risk factors associated with CCHFV infection and estimate the incidence of infection in the study population; characterize patterns of CCHFV seropositivity in wildlife and cattle, as well as vector abundance and actual viral

prevalence within tick vectors; compare the exposure risks for CCHFV in populations within peri-urban and pastoral regions; determine environmental factors associated with the seroprevalence of CCHFV and confirm the accuracy of the only commercially available multi-species anti-CCHFV antibody ELISA using virus neutralization testing in wildlife samples. Together our team will support the coordination of One Health work in Tanzania by bringing together a wide-array of partners and stakeholders to discuss the importance of CCHF in Tanzania, hosting an international symposium on CCHF in East Africa, training a number of Tanzanian students and a post-doctoral fellow and developing policy recommendations to identify the public health risk of CCHF and reduce the threat of a CCHF outbreak in Tanzania.

B. SUMMARY.

Year # 1

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.
Task 3: Determine CCHFV infection patterns in cattle across varying environments.
Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.
Task 5: Disseminate reports to relevant stakeholders.

Year # 2

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.
Task 3: Determine CCHFV infection patterns in cattle across varying environments.
Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.
Task 5: Disseminate reports to relevant stakeholders.

Year #3

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.
Task 3: Determine CCHFV infection patterns in cattle across varying environments.
Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.
Task 5: Disseminate reports to relevant stakeholders.

Year #4 (Optional)

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.
Task 5: Disseminate reports to relevant stakeholders.

Year #5 (Optional)

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.
Task 5: Disseminate reports to relevant stakeholders.
Task 6: Identify environmental correlates with CCHFV seroprevalence.

C. DETAILED TASKS.

Year 1:

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.

Subtasks:

1.1.1 Train a minimum of four graduate students in fields related to CCHFV.
1.1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.
1.1.3 Train staff *in situ* in epidemiological field methods.
1.1.4 Support One Health relationships between partners and stakeholders.

Description and execution: **1) Students:** We will mentor, at minimum, four graduate students or Field Epidemiology Training Program participants in project-related subjects, including field epidemiology, ecology, spatial analysis, public health, entomology and laboratory sciences at local universities. Students may be nominated by Tanzanian partners (including mid-career students that will complete their degree while employed by the Tanzanian government), or will be recruited from local universities (such as Nelson Mandela or Sokoine University of Agriculture). The students, hired as research assistants, will conduct field and laboratory analyses as part of the project (e.g. environmental factors associated with vector prevalence) under the supervision and mentorship of the project staff and their university advisor. The students will be mentored both by project staff in Tanzania and remotely by support staff at EcoHealth Alliance. They will receive the same training as project staff and will be provided comments on study design, implementation plans, analytical methods and drafts of their written work. Skype will be utilized to ensure students are receiving appropriate training by their project mentors and ensure the students are able to hone writing and field/laboratory skills that will further their careers. Students may also have the option to conduct a small, but related, project on another important pathogen using our samples (limited to PCR and/or ELISAs at a BSL-2 level or below). Examples of such pathogens include *Brucella* spp., *Bacillus anthracis*, foot and mouth disease and Rift Valley fever virus. **2) Improve Arusha Centre's (TVLA) laboratory capacity:** Rather than sending samples to the central government laboratories, we will improve the capacity of TVLA's Arusha laboratory to conduct the CCHFV serological and PCR tests (BSL-2). Critical among the sustainable improvements to the Arusha Centre laboratory will be the provision of a generator that will provide backup power during the frequent power outages, thereby protecting samples stored in a provided ultra-freezer and enabling sensitive laboratory analyses to continue. **3) *In situ* training:** Before each of the field studies (Tasks 2, 3, 4 in Y1 and OY1), we will train/retrain the One Health field team. Project staff will be trained to collect biological samples and ticks, to promote animal welfare and ethics, and to understand human subjects research ethics, obtaining valid, informed consent and administering questionnaires (please see the agenda attached). The staff will be cross-trained so that members of the animal health team will be trained to give questionnaires and members of the human health team will be trained to record animal data. **4) Support One Health relationships:** The project will reach out to relevant stakeholders among public health, animal health and environmental agencies operating in and around the study area. We will support relationships between the One Health sectors through outreach and meetings between project partner institutions and stakeholders, who will all be invited to our annual stakeholder meetings.

Resources: **EHA**: 3 research scientists (mentor students, conduct field trainings, support TVLA, support CCHF policy workshop (Y3), organize CCHF symposium (OY2), mentor post-doctoral fellow (OY2), coordinate activities between collaborators); **KCRI**: 1 research scientist, (mentor students, conduct laboratory trainings, organize CCHF symposium, coordinate activities between

collaborators); **TVLA**: 1 research scientist & 1 laboratory technician (ensure Arusha laboratory equipment is installed, mentor students, coordinate activities between collaborators); **UoG**: 2 research scientists & 1 laboratory technician (mentor students, lead the laboratory capacity building, organize CCHF symposium, coordinate activities between collaborators).**WSU**: 1 research scientist (mentor students, conduct field trainings, organize CCHF symposium, coordinate activities between collaborators); **TAWIRI**: 1 research scientist (mentor students, support field trainings, support CCHF policy workshop, coordinate activities between collaborators); **OHCD**: 2 research scientists (mentor students, lead CCHF policy workshop, organize CCHF symposium, coordinate activities between collaborators.

Metrics of success: The number of students recruited, number of pieces of equipment installed in Arusha, number of meetings with partners and stakeholders, number of team members trained.

Deliverable: Students selected to join the project; equipment installed at TVLA.

Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.

Subtasks:

1.2.1 Obtain local permissions and approvals to work with human subjects.

1.2.2 Conduct a cross-sectional study in people within the study area.

Description and execution: **1) Local permissions:** A questionnaire will be developed for use in the cross-sectional study as will the digital data collection tool to implement the survey. Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with human subjects. As part of obtaining local permissions we will also meet with local/village leaders. **2) Human serosurvey:** A human serosurvey will be conducted in the communities within our study area. As the risk of CCHFV infection in people in Tanzania is unknown, villages or geological points will be randomly selected as will the households within the village. All people living or working at the household will be invited to participate. If a household is empty or does not want to participate for any reason another household will be randomly selected. The participants will constitute the population at risk in the prevalence and incidence studies and the random sampling will allow us to estimate the risk of CCHFV infection within the population in the study area. The questionnaire will collect general health information with a focus on potential risk factors for CCHF and tick-borne diseases. Assuming a 23% seroprevalence within the population (based on a serosurvey in Kenya[25]), this study requires 793 people per environmental disturbance level to estimate the expected seroprevalence with 5% absolute precision and 95% confidence in each area (for both areas, n = 1,586). This was calculated using an intra-cluster correlation coefficient of 0.2, and the intention of sampling ten people per household/unit from 79 households/units[37]. The first serosurvey will be initiated in Y1 and completed in Y2. The second serosurvey will be conducted at the same households in OY1. Focusing on pastoral and peri-urban environments, we will specifically evaluate the level of environmental disturbance as a risk factor using a combination of satellite imagery and on the ground surveys/transects to quantify characteristics of disturbance (e.g. human presence). Sample transfer from the field to KCRI is described under Task 3, Y1.

Resources: **EHA**: 3 research scientists, (design study methods, coordinate field activities, design digital data collection tool for collecting data, coordinate activities between collaborators, ensure the curation and analysis of data); **KCRI**: 2 research scientists, 1 nurse & 1 laboratory technician (design study methods, coordinate and implement field activities, conduct CCHFV serological analyses on human sera and analysis of data); **UoG:** 2 research scientists & 1 laboratory technician (design study methods, coordinate activities between collaborators, collaborate with

KCRI on laboratory analyses); **WSU**: 1 research scientist (design study methods and analysis of data); **GAHT**: 1 field assistant (implement field activities).

Metrics of success: The number of permits and permissions obtained, number of people sampled, number of environmental surveys completed.

Deliverable: Obtain all permits and permissions; initiate cross-sectional study.

Task 3: Determine CCHFV infection patterns in cattle across varying environments.

Subtasks:

1.3.1 Obtain local permits and permissions.

1.3.2 Conduct a cross-sectional serosurvey in cattle across two levels of environmental disturbance.

1.3.3 Collect and identify *Hyalomma spp.* ticks from sampled cattle.

Description and execution: **1) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with human and animal subjects, and discuss the project with local community leaders. **2) Cattle serosurvey:** Assuming a 41% seroprevalence within the cattle population (preliminary data), this study requires at least 542 animals per level of environmental disturbance to estimate the seroprevalence with 5% absolute precision and 95% confidence in each area; however, we will collect blood samples from all cattle that are sampled for the tick analysis (n = 1,200) **3) Tick abundance:** To evaluate the difference in CCHFV vector abundance and viral prevalence in the ticks across two of the landscape disturbance gradients (peri-urban and pastoral lands), we will collect and test ticks from the cattle in the serosurvey. Using a mixed effect negative binomial simulation model in R[38], we determined that by sampling 15 cattle per herd, at a minimum of 40 sites in each of the two environmental disturbance levels (n= 1,200) and assuming a ratio of 1:3 in the mean number of ticks between the two levels, this study will have a power of 0.97 to detect a difference in infection prevalence between the two areas (estimated by 700 simulations using a random variance from ticks of 1.4 , calculated using the same model on ticks collected from cattle on farms in South Africa; M. Rostal, unpublished data). The characterization of the environmental disturbance is described in Task 2. Samples will be transferred directly to TVLA (animal samples) or KCRI (human samples) following the return of the team from the field. Samples will be processed by each laboratory (see the PRAT for details), serum will be aliquoted and logged into the DTRA inventory. Until testing, samples will be frozen at -20°C or -80°C in the designated and secure freezers within each laboratory. While it is not anticipated that CCHFV will be present in the serum samples, sera will be inactivated. Aside from a randomly selected subset of samples transferred to the U.K. for confirmatory testing (see Y3, Task 3), all samples will remain in their respective laboratories for the duration of the project and kept as a biobank following the study to allow for serological studies targeting other pathogens. Both the field and laboratory teams will receive safe sample handling and biosecurity training (see attached syllabi). Laboratory security details are indicated the PRAT form.

Resources: **EHA**: 2 research scientists (design study methods, conduct field sampling, coordinate activities between collaborators, ensure the curation and analysis of data); **TVLA**: 1 research scientist & 3 laboratory technicians (Y3) (identification of ticks, conduct serological analyses, conduct PCR on tick samples and contribute to analysis of data); **UoG**: 2 research scientists & 1 laboratory technician (design study methods, coordinate activities between collaborators, collaborate with TVLA on laboratory analyses); **WSU**: 1 research scientist (design study

methods, coordinate field activities and analysis of data); **GAHT**: 1 veterinarian & 1 field team assistant (conduct field sampling, and contribute to analysis).
Metrics of success: The number of permits and permissions obtained, number of cattle sampled, number of ticks collected.
Deliverable: Obtained permits and permissions; initiated the cattle cross-sectional study.

Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.
Subtasks:
1.4.1 Obtain local permits and permissions.
1.4.2 Conduct cross-sectional study in small mammals.
1.4.3 Collect ticks from vegetation at study sites.

Description and execution: **1) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with wildlife subjects. **2) Wildlife serosurvey:** Small mammals will be trapped at each of the cattle/human sampling sites for two nights per site. Traps will be set, mammals that are captured will be immobilized, sampled, and (following recovery) released under the supervision of the veterinarian. We will collect all ticks observed on the small mammals to determine the relative abundance and diversity of tick species. Using a mixed effect negative binomial simulation model, we determined that by sampling 15 small mammals per site, assuming that three animals per site have *Hyalomma* spp. ticks, from at least 40 sites in each of the three gradients (peri-urban, pastoral and protected land) and assuming there is a difference in the mean number of ticks between each gradient of 1:3 this study will have a power of 1.00 to detect differences in seropositivity after 700 simulations (using the random variance from ticks collected from rodents at sites in South Africa, 1.5[39]). The characterization of the environmental disturbance is described in Task 2. **3) Tick abundance**: At each site, a set of four transects will be conducted to collect ticks. Ticks will be collected from the vegetation using flagging [40].
Resources: **EHA**: 2 research scientists (design study methods, coordinate activities between collaborators, conduct field work, ensure the curation and analysis of data); **TVLA**: 1 research scientist & 3 laboratory technicians (Y3) (identification of ticks; conduct serological and PCR analyses and contribute to analysis of data); **UoG**: 2 research scientists & 1 laboratory technician (Y3) (design study methods, coordinate activities between collaborators, collaborate with TVLA on laboratory analyses); **WSU**: 1 research scientist (design study methods, coordinate field activities and analysis of data); **GAHT**: 1 veterinarian & 1 field team assistant (conduct field sampling, and contribute to analysis of data); **TAWIRI**: 1 research scientist & 1 field technician (design study methods, implement and coordinate field sampling); **PHE**: 1 research scientist & 3 laboratory technicians (test a subset of wildlife samples using virus neutralization; OY2).
Metrics of success: The number of permits and permissions obtained, number of small mammals sampled, number of ticks transects conducted, the number of ticks collected.
Deliverable: Obtained permits and permissions; initiated wildlife cross-sectional study.

Task 5: Disseminate reports to relevant stakeholders.
Subtasks:
1.5.1 Submit reports, including sample repository data, to DTRA.
1.5.2 Complete annual report to local stakeholders.
1.5.3 Host annual partners' and stakeholders' meeting.
1.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

1.5.5 Maintain samples in biobanks.

Description and execution: **1) Submit reports:** All activities, results and capacity building activities will be summarized on a quarterly or annual basis. **2) Report to stakeholders:** We will work with stakeholders and community members to inform them of the project prior to initiating work in their communities and to identify and use the best method to communicate the aggregate results back to the communities that participate in the study. These community meetings are especially important as, not having been diagnosed in Tanzania previously, awareness of CCHF is low. **3) Stakeholder meeting:** An annual Stakeholders' and Partners' Meeting will be hosted to inform stakeholders of progress and receive feedback and input on the project. Local and national representatives of public, veterinary and environmental health/sciences as well as medical and laboratory officers and community leaders will be invited. **4) Presentations:** PIs and KP will give presentations at the times and places specified in the grant schedule. **5) Biobanks:** Biobank sample repository information will be maintained in a DTRA-specified format and all samples and data generated during the course of the project will be available for at least 12 months after the project end date. Additionally, a database will be developed, used for epidemiological analyses and shared among implementing partners (including government partners). While sensitive human data will remain protected, we will work with government partners and stakeholders to provide aggregated data as requested.

Resources: **EHA**: 4 research scientists (synthesize communication between partners, ensure data management for reporting, develop reports for DTRA and stakeholders; host stakeholder meeting); **KCRI**: 1 research scientist (submit human serological results and human survey data to database, contribute to reporting, maintain human samples in a biobank and complete the DTRA inventory); **TVLA**: 1 research scientist (submit animal and tick laboratory results, contribute to reporting, maintain animal and tick samples in a biobank and complete the DTRA inventory); **UoG**: 1 research scientist (contribute to reporting, maintain any project samples submitted for confirmation at UoG and complete the DTRA inventory); **WSU**: 1 research scientist (contribute to reporting); **GAHT**: 1 veterinarian (upload field data into database from animal studies, contribute to reporting); **TAWIRI**: 1 research scientist (contribute to reporting); **OHCD-PMO**: 2 research scientists (contribute to reporting); **PHE**: 1 research scientist (contribute to reporting).

Metrics of success: The number of reports (quarterly, annual, repository, etc.) written, number of samples in biobanks, number of attendees to stakeholder meeting, number of presentations given.

Deliverable: Communication via reports to the funder; scientific community and stakeholders; biobank sample repository maintained in a DTRA specified format.

Year 2:

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.

Subtasks:

2.1.1 Train a minimum of four graduate students in fields related to CCHFV.

2.1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.

2.1.3 Train staff *in situ* in epidemiological field methods.

2.1.4 Support One Health relationships between partners and stakeholders.

2.1.5 Support laboratory capacity to conduct CCHFV diagnostics.

Description, execution and resources: Same as above; see Y1, Task 1. **5) CCHF diagnostics:** UoG will prepare CCHFV-specific reagents (recombinant antigen for ELISA and primers and

probes for PCR) for KCRI and TVLA, as well as additional recombinant antigen to transfer reagents to local health laboratories whose technicians will attend the Y3 workshop.
Metrics of success: The number of students working on the project, number of laboratory reagent kits prepared for TVLA and KCRI, number of meetings with partners and stakeholders.
Deliverable: Continue training graduate students.

Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.

Subtasks:

2.2.2 Conduct a cross-sectional study in people within the study area.

Description, execution and resources: Same as above; see Y1, Task 2.
Metrics of success: Number of people sampled, number of environmental surveys completed.
Deliverable: Completed sampling for human cross-sectional study.

Task 3: Determine CCHFV infection patterns in cattle across varying environments.

Subtasks:

2.3.2 Conduct a cross-sectional serosurvey in cattle across two levels of environmental disturbance.

2.3.3 Collect and identify *Hyalomma spp.* ticks from sampled cattle.

Description, execution and resources: Same as above; see Y1, Task 3.
Metrics of success: The number of cattle sampled, number of ticks collected.
Deliverable: Completed cross-sectional cattle sampling.

Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.

Subtasks:

2.4.2 Conduct cross-sectional study in small mammals.

2.4.3 Collect ticks from vegetation at study sites.

Description, execution and resources: Same as above; see Y1, Task 4.
Metrics of success: The number of small mammals sampled, number of tick transects completed.
Deliverable: Completed cross-sectional wildlife sampling and tick transects.

Task 5: Disseminate reports to relevant stakeholders.

Subtasks:

2.5.1 Submit reports, including sample repository data, to DTRA.

2.5.2 Complete annual report to local stakeholders.

2.5.3 Host annual partners' and stakeholders' meeting.

2.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

2.5.5 Maintain samples in biobanks.

Description, execution and resources: Same as above; see Y1, Task 5.
Metrics of success: The number of reports written, number of samples in biobanks, number of attendees to stakeholder meeting, number of presentations given.
Deliverable: Communication via reports to the funder; scientific community and stakeholders; biobank sample repository maintained in a DTRA specified format.

Year 3:

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.

Subtasks:

3.1.1 Train a minimum of four graduate students in fields related to CCHFV.

3.1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.

3.1.4 Support One Health relationships between partners and stakeholders.
3.1.5 Support laboratory capacity to conduct CCHFV diagnostics.
3.1.6 Host one workshop on diagnostic testing for CCHFV at each KCRI and TVLA.

Description, execution and resources: Same as above; see Y1, Task 1. **5) CCHF diagnostics:** During the two years of laboratory work, we will have a dedicated UoG technician that will work directly with the Tanzanian laboratories (KCRI and TVLA) to train local technicians to perform CCHFV serological and PCR assays. To ensure the training is sustainable, the UoG technician will spend 8 months in Tanzania working directly with project laboratory technicians at KCRI and TVLA and will remain in contact with the teams at TVLA and KCRI for the duration of the laboratory activities (Y3-OY1). **6) CCHFV laboratory diagnostics workshops:** PIs Mmbaga and Mramba and the UoG technician will host a workshop at each TVLA and KCRI. Participants of the TVLA workshop will include staff from KCRI and TVLA that will be working on this project as well as other laboratory technicians/scientists from other animal health laboratories. In addition to the laboratory techniques demonstrated (ELISA and PCR), there will be a focus on biosecurity (appropriate sample handling, storage and inactivation) as well as the importance of One Health, demonstrating the role that animal health workers play in protecting humans from CCHFV. The second workshop, at KCRI, will target laboratory scientists and technicians from local, regional and national public health or medical laboratories. This training will focus on the diagnostics, biosecurity, clinical manifestations, epidemiology and infection control for laboratories, clinics and hospitals that may treat or diagnose CCHFV-infected patients. Following both workshops, all participating laboratories will be provided with PCR primers and probes and human health labs will be given the recombinant CCHFV antigen as well as protocols to reproduce it so that it may be sustainably and locally used after the project ends. As the CCHFV protocols are new to KCRI and TVLA, a randomly selected subset of human and cattle serum aliquots will be submitted to UoG for confirmatory testing using ELISA (Y3). A subset of the wildlife sera will be submitted to PHE to confirm the results using virus neutralization (see OY2.4.8). Samples that are shipped to the UK will be inactivated prior to shipment and packed and labeled according to IATA standards on dry ice, with a chain of custody.

Metrics of success: The number of students working on the project, number of meetings with partners and stakeholders, number of team members trained, number of workshops hosted, number of laboratories attending the workshops.

Deliverable: Completed CCHFV diagnostics workshops; initiated testing at the Tanzanian laboratories.

Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.

Subtasks:
3.2.3 Conduct serological assays for the presence of anti-CCHFV antibodies.
3.2.4 Analyze human serosurvey results.

Description, execution and resources: Same as above; see Y1, Task 2. **3) Laboratory assays:** Human samples will be analyzed using a CCHFV ELISA[31] at KCRI. **4) Statistical analyses:** Similar analytical methods will be applied across species (people, cattle, wildlife and ticks). CCHFV prevalence (ticks) and seroprevalence (people, cattle and wildlife) will be calculated using standard methods[41]. Risk factors for individuals will be determined using standard multiple logistic regression techniques. Comparisons between different levels of environmental disturbance will be conducted using Generalized Linear Mixed Models (GLMMs) in a manner similar to the simulation used to calculate the sample size and power.

Metrics of success: Number of human samples tested.
Deliverable: Initiated the laboratory analyses of the human samples.

Task 3: Determine CCHFV infection patterns in cattle across varying environments.

Subtasks:
3.3.3 Collect and identify *Hyalomma spp.* ticks from sampled cattle.
3.3.4 Conduct laboratory analyses on cattle ticks and sera.
3.3.5 Analyze cattle serosurvey results.

Description, execution and resources: Same as above; see Y1, Task 3. **3) Tick identification:** An experienced TVLA technician will identify the ticks to the species level. **4) Laboratory analyses:** Serum samples will be analyzed using the ID Screen® CCHF Double Antigen Multi-species ELISA at TVLA, which has been vetted using livestock samples. Ticks will be screened by RT-PCR for viral RNA[30]. **5) Statistical analyses:** The analytical methods indicated in Task 2 will be used to calculate the cattle seroprevalence.
Metrics of success: The number of cattle samples tested, number of ticks identified, number of ticks tested.
Deliverable: Completed the testing of cattle samples and ticks and reported the results.

Task 4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.

Subtasks:
3.4.4 Identify ticks collected from small mammals and transects.
3.4.5 Conduct laboratory analyses for CCHFV antibodies and viral RNA.
3.4.6 Test banked serum from wild ungulates.
3.4.7 Analyze wildlife serosurvey results.

Description, execution and resources: Same as above; see Y1, Task 4. **4) Tick identification:** An experienced TVLA technician will identify the ticks to species. **5) Laboratory analyses:** Wildlife samples will be analyzed using the ID Screen® CCHF Double Antigen Multi-species ELISA at TVLA, a subset of samples will be confirmed by virus neutralization at PHE (see OY2.4.8). Ticks will be tested using rt-PCR[30]. **6) Wild ruminant samples:** We have established a relationship with an ongoing TAWIRI study investigating peste des petits ruminants virus, which will collect and archive blood and tick samples from wild ruminants that may be accessed. TAWIRI will also provide samples collected opportunistically from wild ruminants immobilized for management reasons in the Serengeti. This will provide serology results from ruminants in the protected area and will be screened using the ID Screen® CCHF Double Antigen Multi-species ELISA at TVLA. **7) Statistical Analyses:** The analytical plan described in Task 2 will also be used for the wild ruminant study. Tick abundance and richness measures will be estimated and will be compared between the different levels of environmental disturbance within the study area using traditional ecological tools such as Non-Metric Multidimensional Scaling (NMDS) to compare diversity metrics with environmental factors.
Metrics of success: The number of wildlife samples tested, number of ticks identified, number of ticks tested.
Deliverable: Completed ELISA testing of wildlife samples; completed tick identification and PCR testing; completed Y3 report of serosurvey results.

Task 5: Disseminate reports to relevant stakeholders.

Subtasks:
3.5.1 Submit reports, including sample repository data, to DTRA.
3.5.2 Complete annual report to local stakeholders.

3.5.3 Host annual partners' and stakeholders' meeting.
3.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
3.5.5 Maintain samples in biobanks.
3.5.6 Complete reports on results of human, cattle and wildlife cross-sectional studies and comparison across the gradient.

Description, execution and resources: Same as above; see Y1, Task 5. **6) Summary report:** A report on the results of the cattle and wildlife cross-sectional studies, a comparison across gradient and the preliminary results of the serosurvey in people will be written.
Metrics of success: The number of reports written, number of samples in biobanks, number of attendees to stakeholder meeting, number of presentations given.
Deliverable: Communication via reports to the funder; scientific community and stakeholders; biobank sample repository maintained in a DTRA specified format; completed the syntheses report on serological results, tick abundances and viral prevalence.

Year OY1:

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.

Subtasks:
OY1.1.1 Train a minimum of four graduate students in fields related to CCHFV.
OY1.1.3 Train staff *in situ* in epidemiological field methods.
OY1.1.4 Support One Health relationships between partners and stakeholders.
OY1.1.5 Support laboratory capacity to conduct CCHFV diagnostics.
OY1.1.7 Host a workshop to support CCHF policy development in Tanzania.

Description, execution and resources: Same as above; see Y1, Task 1. **6) Policy development workshop:** We propose to bring together a group of One Health participants from government agencies, including representatives from the Ministry of Health, Community Development, Gender, Elderly and Children, Ministry of Natural Resources and Tourism and the Ministry of Livestock and Fisheries to discuss the potential implications of the study results and develop a series of recommendations for reducing the risk of CCHF outbreaks in Tanzania. The workshop will be led by OHCD-PMO and supported by the PI institutions.
Metrics of success: The number of students working on the project, number of meetings with partners and stakeholders, number of team members trained, number of attendees at the CCHF policy workshop.
Deliverable: Successfully conducted the CCHF policy workshop.

Task 2: Determine CCHFV infection patterns, risk factors and incidence in humans.

Subtasks:
OY1.2.3 Conduct serological assays for the presence of anti-CCHFV antibodies.
OY1.2.4 Analyze human serosurvey results.
OY1.2.5 Conduct incidence sampling among cross-sectional study participants.

Description, execution and resources: Same as above; see Y1, Task 2. **5) Incidence study:** During OY1 we propose to resample voluntary participants that were sampled during the initial cross-sectional study completed in Y1-Y2 in order to estimate the incidence of CCHFV infection. The diagnostic assays will be completed at KCRI (see Y3). CCHFV incidence will be calculated using standard methods[41]. We will use multiple logistic regression to identify risk

factors for CCHFV infection and compared to those identified through the prevalence study. We will also develop species specific and combined seropositivity hot spot maps of the study area.
Metrics of success: The number of people resampled, the number of samples tested.
Deliverable: Completed human longitudinal sampling and testing.

Task 5: Disseminate reports to relevant stakeholders.

Subtasks:
OY1.5.1 Submit reports, including sample repository data, to DTRA.
OY1.5.2 Complete annual report to local stakeholders.
OY1.5.3 Host annual partners' and stakeholders' meeting.
OY1.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
OY1.5.5 Maintain samples in biobanks.
Description and execution: Same as above; see Y1, Task 5.
Metrics of success: The number of reports written, number of samples in the biobanks, number of participants at the stakeholders' meeting, number of presentations given.
Deliverable: Communication via reports to the funder; scientific community and stakeholders; biobank sample repository maintained in a DTRA specified format.

Year OY2:

Task 1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.

Subtasks:
OY2.1.1 Train a minimum of four graduate students in fields related to CCHFV.
OY2.1.4 Support One Health relationships between partners and stakeholders.
OY2.1.8 Mentor a Tanzanian post-doctoral fellow in spatial ecology of infectious diseases.
OY2.1.9 Host East African CCHF Symposium.
Description and execution: Same as above; see Y1, Task 1. **7) Train post-doctoral fellow:** We will identify a Tanzanian post-doctoral fellow (through an application process or partner recommendations) to be trained in the spatial ecology of infectious diseases, work with scientists at EcoHealth Alliance and complete the remote sensing analysis of environmental variables associated with CCHF seroprevalence. The post-doctoral fellow will be supervised by KP Zambrana-Torrelio as well as PIs Rostal and Karesh (see post-doctoral mentoring plan). **8) Host CCHF Symposium:** As CCHF is an emerging disease and it has rarely been studied in East Africa, we will host a symposium to bring together experts on CCHF from other regions of the world (e.g. Central Asia, South Africa) to exchange ideas on additional research that is needed, ways of increasing support for the growing group of CCHF experts in East Africa, including through further networking, and ideas about the applicability of control measures being used in other regions that may be transferable to the situation in East Africa.
Metrics of success: The number of students working on the project, number of meetings with partners and stakeholders, number of attendees at the CCHF symposium.
Deliverable: Post-doctoral fellow completed his/her fellowship; hosted a CCHF symposium.

Task 4: Determine CCHFV exposure and CCHFV infection patterns in wildlife and ticks.

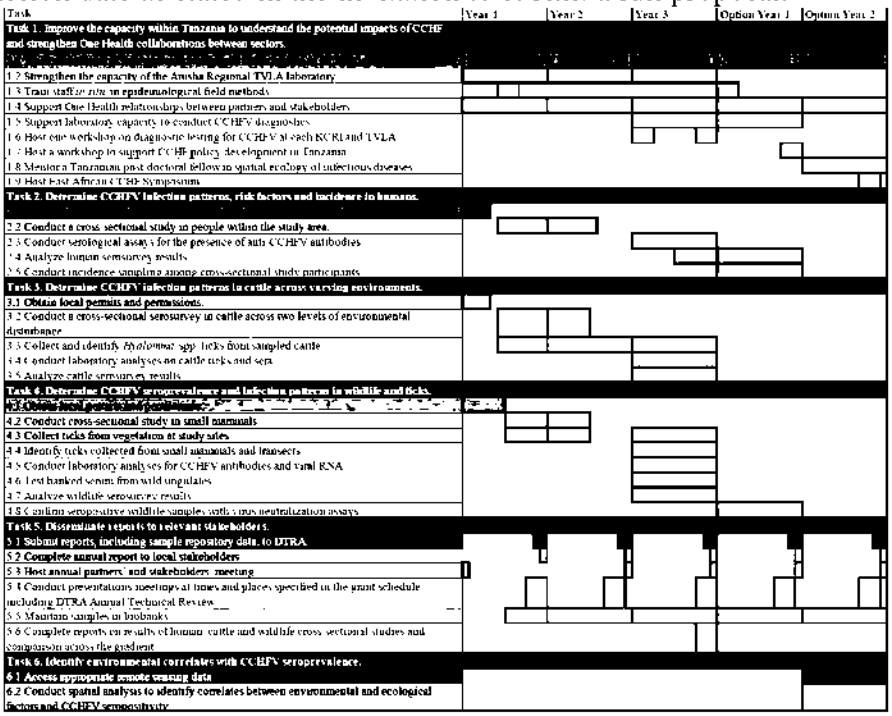
Subtasks:
OY2.4.8 Confirm seropositive wildlife samples with virus neutralization assays.
Description, execution and resources: **8) Confirm seropositive samples:** The serological analysis of small mammal sera will allow the estimation of seroprevalence and implication of

potentially important species for future research on CCHFV ecology in Tanzania and East Africa. While this multispecies ELISA is designed to work in multiple species, it is able to differentiate CCHFV seropositive and seronegative sera from livestock as well as correctly identify seronegative wildlife, it has not been validated on any seropositive wildlife samples[42]. Thus, it is important to validate this safe (BSL-2) multispecies ELISA. As CCHFV is a select agent requiring BSL-4 containment, we have partnered with PHE to verify the ELISA results on a subsample of wildlife samples that will be tested using virus neutralization (VNT). PHE has a biosecure facility (see facilities and the PRAT form) and protocols in place to conduct such assays (details of sample shipments are given Task 3.2).
Metrics of success: The number of wildlife samples tested with VNT.
Deliverable: Completed the verification of wildlife serology results.
Task 5: Disseminate reports to relevant stakeholders.
Subtasks:
OY2.5.1 Submit reports, including sample repository data, to DTRA.
OY2.5.2 Complete annual report to local stakeholders.
OY2.5.3 Host annual partners' and stakeholders' meeting.
OY2.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
OY2.5.5 Maintain samples in biobanks.
Description and execution: Same as above; see Y1, Task 5.
Metrics of success: The number of reports written, number of samples in biobanks, number of attendees to stakeholder meeting, number of presentations given.
Deliverable Communication via reports to the funder; scientific community and stakeholders; biobank sample repository maintained in a DTRA specified format; completed final report with policy recommendations.
Task 6: Identify environmental correlates with CCHFV seroprevalence.
Subtasks:
OY2.6.1 Access appropriate remote sensing data.
OY2.6.2 Conduct spatial analysis to identify correlates between environmental and ecological factors and CCHFV seropositivity.
Description and execution: The Tanzanian post-doctoral fellow would be supported for one year at EcoHealth Alliance to conduct the analysis proposed within this task and will be directly supervised by KP Zambrana-Torrelio. **1) Remote sensing and other spatial data:** We will access and use the following remote sensing products: NASA's ECOSTRESS data (ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station) that provides data on vegetation water stress and LandSat data, as well as remote sensing derived data such as NDVI and enhanced vegetation index (EVI). Additional datasets will be obtained from different sources, including soil type maps and climate predictions. **2) Correlates between CCHFV seropositivity and the environment:** Spatially explicit correlates will be used to understand the relationship between environmental factors and seropositivity in humans, livestock and wildlife as well as vector and viral prevalence. We will characterize the potential ecological niche of CCHFV in our study sites and use this to identify other areas in Tanzania where CCHFV may be present but has not yet been detected. These results will be shared with government partners in Tanzania to be considered with the policy recommendations produced under Task 1 OY1.

Resources: **EHA**: 3 research scientists (design study methods, coordinate activities between collaborators, conduct the analysis of data); **KCRI**: 1 research scientist (contribute to the analysis); **TVLA**: 1 research scientist (contribute to the analysis); **UoG**: 1 research scientist (contribute to the analysis); **WSU**: 1 research scientist (contribute to the analysis).
Metrics of success: Number of remote sensing datasets accessed.
Deliverable: Completed environmental analysis.

Confirmed Proposal Expiration Date "EHA holds the proposal, to include proposed costs, firm for 180 days after the submission date as stated in the invitation to submit a full proposal."

IV. PERFORMANCE SCHEDULE.



V. REFERENCES.

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RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 1** **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Melinda		Rostal		101,556.00	5.00			42,315.00	13,316.53	55,631.53
Project Role:	PI										
Dr.	William		Karesh		284,108.00	1.00			23,675.71	7,450.74	31,126.45
Project Role:	Co PI										
Dr.	Carlos		Zambrana		119,070.00	0.50			4,961.25	1,561.31	6,522.56
Project Role:	Research Scientist, Ecologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 93,280.54

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant	5.00			24,375.00	6,136.65	30,511.65
1	Operations Assistant	3.50			16,247.48	5,113.08	21,360.56
1	Field Coordinator	12.00			65,000.00	20,455.50	85,455.50
3	**Total Number Other Personnel**					**Total Other Personnel**	137,327.71

Total Salary, Wages and Fringe Benefits (A+B) 230,608.25

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Vehicle + Fridge	77,489.00
Generator	23,000.00
Centrifuge	5,000.00
TVUA -80 Freezer	20,000.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 125,489.00

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	1,750.00
2.	Foreign Travel Costs	67,571.00
	Total Travel Cost	69,321.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	66,773.00
2.	Publication Costs	
3.	Consultant Services	25,000.00
4.	ADP/Computer Services	4,000.00
5.	Subawards/Consortium/Contractual Costs	304,521.26
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Stakeholder Meeting	10,000.00
9.		
10.		
	Total Other Direct Costs	410,294.26

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	835,712.51

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	32.74		162,088.66
		Total Indirect Costs	162,088.66

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	997,801.17

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	997,801.17

L. Budget Justification

(Only attach one file.) 1267 EHA CCHF Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Melinda		Rostal		106,633.80	5.00			44,430.75	13,982.36	58,413.11
Project Role:	PI										
Dr.	William		Karesh		298,313.00	1.00			24,859.43	7,823.29	32,682.77
Project Role:	Co PI										
Dr.	Carlos		Zambrana		125,023.50	2.00			20,837.25	6,557.48	27,394.73
Project Role:	Research Scientist, Ecologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 118,490.61

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant	5.00			25,593.75	8,054.35	33,648.10
1	Operations Assistant	2.00			9,748.49	3,067.85	12,816.34
1	Field Coordinator	12.00			68,250.00	21,478.28	89,728.28
3	**Total Number Other Personnel**					**Total Other Personnel**	136,192.72

Total Salary, Wages and Fringe Benefits (A+B) 254,683.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,350.00
2. Foreign Travel Costs	78,513.00
Total Travel Cost	84,863.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	40,068.65
2.	Publication Costs	1,500.00
3.	Consultant Services	40,000.00
4.	ADP/Computer Services	4,000.00
5.	Subawards/Consortium/Contractual Costs	344,728.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Stakeholders Meeting	10,000.00
9.		
10.		
	Total Other Direct Costs	440,296.65

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	779,842.98

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	32.74		147,243.09
		Total Indirect Costs	147,243.09

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	927,086.07

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	927,086.07

L. Budget Justification

(Only attach one file.) 1267 EHA CCHF Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Melinda		Rostal		111,956.00	5.00			46,652.29	14,681.47	61,333.76
Project Role:	PI										
Dr.	William		Karesh		313,230.00	1.00			26,102.47	8,214.45	34,316.92
Project Role:	Co PI										
Dr.	Carlos		Zambrana		131,275.00	0.50			5,469.78	1,721.34	7,191.12
Project Role:	Research Scientist, Ecologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 102,841.80

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant	5.00			26,873.44	8,457.07	35,330.51
1	Operations Assistant	2.00			10,235.91	3,221.24	13,457.15
1	Field Coordinator	12.00			71,668.50	22,552.19	94,214.69
3	**Total Number Other Personnel**					**Total Other Personnel**	143,002.35

Total Salary, Wages and Fringe Benefits (A+B) 245,844.15

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,350.00
2. Foreign Travel Costs	41,206.60
Total Travel Cost	47,556.60

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	4,682.70
2.	Publication Costs	1,500.00
3.	Consultant Services	40,000.00
4.	ADP/Computer Services	4,000.00
5.	Subawards/Consortium/Contractual Costs	517,698.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Stakeholder Meeting	10,000.00
9.		
10.		
	Total Other Direct Costs	577,880.70

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	871,281.45

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	32.74		121,389.07
		Total Indirect Costs	121,389.07

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	992,670.52

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	992,670.52

L. Budget Justification

(Only attach one file.) 1267 EHA CCHF Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Melinda		Rostal		117,564.00	5.00			48,984.90	15,415.55	64,400.45
Project Role:	PI										
Dr.	William		Karesh		328,891.00	1.00			27,407.53	8,625.17	36,032.76
Project Role:	Co PI										
Dr.	Carlos		Zambrana		137,838.00	0.50			5,743.27	1,807.41	7,550.68
Project Role:	Research Scientist, Ecologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 107,983.89

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant	5.00			28,217.11	8,879.92	37,097.03
1	Operations Assistant	2.00			10,747.71	3,382.30	14,130.01
1	Field Coordinator	12.00			75,245.63	23,679.80	98,925.43
3	**Total Number Other Personnel**					**Total Other Personnel**	150,152.47

Total Salary, Wages and Fringe Benefits (A+B) 258,136.36

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,350.00
2. Foreign Travel Costs	58,968.91
Total Travel Cost	65,318.91

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	36,890.45
2.	Publication Costs	3,000.00
3.	Consultant Services	30,000.00
4.	ADP/Computer Services	4,000.00
5.	Subawards/Consortium/Contractual Costs	455,338.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Stakeholders Meeting	10,000.00
9.		
10.		
	Total Other Direct Costs	539,228.45

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	862,683.72

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	32.74		137,064.21
		Total Indirect Costs	137,064.21

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	999,747.93

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	999,747.93

L. Budget Justification

(Only attach one file.) 1267 EHA CCHF Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Melinda		Rostal		123,442.00	5.00			51,434.15	16,186.33	67,620.48
Project Role:	PI										
Dr.	William		Karesh		345,336.00	2.00			57,555.94	18,112.85	75,668.79
Project Role:	Co PI										
Dr.	Carlos		Zambrana		144,730.00	3.00			36,182.58	11,386.66	47,569.24
Project Role:	Research Scientist, Ecologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 190,858.51

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	Post Doctoral Associates	12.00			65,000.00	20,455.50	85,455.50
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Research Assistant	5.00			29,627.96	9,323.92	38,951.88
1	Operations Assistant	2.00			11,285.09	3,551.42	14,836.51
3	**Total Number Other Personnel**					**Total Other Personnel**	139,243.89

Total Salary, Wages and Fringe Benefits (A+B) 330,102.40

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	6,350.00
2. Foreign Travel Costs	50,555.02
Total Travel Cost	56,905.02

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	54,720.00
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	54,720.00

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,188.26
2.	Publication Costs	3,000.00
3.	Consultant Services	30,000.00
4.	ADP/Computer Services	24,000.00
5.	Subawards/Consortium/Contractual Costs	230,379.00
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Stakeholders Meeting	10,000.00
9.	Symposium Costs (non-participant)	10,000.00
10.	Staff Recruitment	7,500.00
	Total Other Direct Costs	321,067.26

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	762,784.68

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	32.74		168,392.77
		Total Indirect Costs	168,392.77

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	931,177.45

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	931,177.45

L. Budget Justification

(Only attach one file.) 1267 EHA CCHF Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		613,455.35
Section B, Other Personnel		705,919.14
Total Number Other Personnel	15	
Total Salary, Wages and Fringe Benefits (A+B)		1,319,374.49
Section C, Equipment		125,489.00
Section D, Travel		333,964.53
1. Domestic	27,150.00	
2. Foreign	296,814.53	
Section E, Participant/Trainee Support Costs		54,710.00
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel	54,710.00	
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		2,288,767.32
1. Materials and Supplies	154,603.06	
2. Publication Costs	9,000.00	
3. Consultant Services	165,000.00	
4. ADP/Computer Services	40,000.00	
5. Subawards/Consortium/Contractual Costs	1,852,664.26	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	50,000.00	
9. Other 2	10,000.00	
10. Other 3	7,500.00	
Section G, Direct Costs (A thru F)		4,112,305.34
Section H, Indirect Costs		736,177.80
Section I, Total Direct and Indirect Costs (G + H)		4,848,483.14
Section J, Fee		
Section K, Total Costs and Fee (I + J)		4,848,483.14

OMB Number: 4040-0001
Expiration Date: 10/31/2019

10 YEAR R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Instructions: On this form, you will attach the 10 Year R&R Subaward Budget files for your grant application. Complete the subawardee budget(s) in accordance with the 10 Year R&R budget instructions. Please remember that any files you attach must be a PDF document.

Click here to extract the 10 Year R&R Subaward Budget Attachment

Important: Please attach your subawardee budget file(s) with the file name of the subawardee organization. Each file name must be unique.

1) Please attach Attachment 1	KCRI		Delete Attachment	View Attachment
2) Please attach Attachment 2	OHCD PMO		Delete Attachment	View Attachment
3) Please attach Attachment 3	PIE		Delete Attachment	View Attachment
4) Please attach Attachment 4	CAMERI		Delete Attachment	View Attachment
5) Please attach Attachment 5	EVLA		Delete Attachment	View Attachment
6) Please attach Attachment 6	CofG		Delete Attachment	View Attachment
7) Please attach Attachment 7	WSU		Delete Attachment	View Attachment
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850502437000O **Enter name of Organization:** Kilimanjaro Clinical Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Blandina		Yrbaga		60,000.00	1.20			6,000.00	0.00	6,000.00

Project Role: Co PI, Epidemiologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.20			2,400.00	0.00	2,400.00
1	Lab Technician	1.00			2,000.00	0.00	2,000.00
1	Nurse	6.00			12,000.00	0.00	12,000.00
1	Anthropologist/Epidemiologist	12.00			30,000.00	0.00	30,000.00
1	Finance	0.84			2,100.00	0.00	2,100.00

5 **Total Number Other Personnel**

Total Other Personnel 48,500.00

Total Salary, Wages and Fringe Benefits (A+B) 54,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,500.00
	Total Travel Cost	3,500.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,400.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,400.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	60,400.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		6,040.00
		Total Indirect Costs	6,040.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	66,440.00

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	66,440.00

L. Budget Justification

(Only attach one file.) 1268 KCRI _Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850502437000O **Enter name of Organization:** Kilimanjaro Clinical Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Blandina		Yrbaga		60,000.00	1.20			6,000.00	0.00	6,000.00

Project Role: Co PI, Epidemiologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.20			2,400.00	0.00	2,400.00
1	Lab Technician	1.00			2,000.00	0.00	2,000.00
1	Nurse	6.00			12,000.00	0.00	12,000.00
1	Anthropologist/Epidemiologist	12.00			30,900.00	0.00	30,900.00
1	Finance	0.84			2,100.00	0.00	2,100.00

5 **Total Number Other Personnel**

Total Other Personnel 49,400.00

Total Salary, Wages and Fringe Benefits (A+B) 55,400.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,605.00
	Total Travel Cost	3,605.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,520.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,520.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	61,525.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		6,152.50
		Total Indirect Costs	6,152.50

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	67,677.50

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	67,677.50

L. Budget Justification

(Only attach one file.) 1268 KCRI _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850502437000O **Enter name of Organization:** Kilimanjaro Clinical Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Blandina		Yrbaga		60,000.00	1.20			6,000.00	0.00	6,000.00

Project Role: Co PI, Epidemiologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.20			2,400.00	0.00	2,400.00
2	Lab Technician	12.00			48,000.00	0.00	48,000.00
1	Nurse	0.00			0.00	0.00	0.00
1	Anthropologist/Epidemiologist	6.00			15,913.50	0.00	15,913.50
1	Finance	0.84			2,100.00	0.00	2,100.00

6 **Total Number Other Personnel**

Total Other Personnel 68,413.50

Total Salary, Wages and Fringe Benefits (A+B) 74,413.50

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	0.00
	Total Travel Cost	0.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	1,800.00
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / Total Participant/Trainee Support Costs	1,800.00

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	16,802.10
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	10,666.67
9.		
10.		
	Total Other Direct Costs	27,468.77

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	103,682.27

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		10,368.23
		Total Indirect Costs	10,368.23

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	114,050.50

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	114,050.50

L. Budget Justification

(Only attach one file.) 1268 KCRI _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850502437000O **Enter name of Organization:** Kilimanjaro Clinical Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Blandina		Yrbaga		60,000.00	1.20			6,000.00	0.00	6,000.00

Project Role: Co PI, Epidemiologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.20			2,400.00	0.00	2,400.00
2	Lab Technician	12.00			48,000.00	0.00	48,000.00
2	Nurse	6.00			24,000.00	0.00	24,000.00
1	Anthropologist/Epidemiologist	12.00			32,781.81	0.00	32,781.81
1	Finance	0.84			2,100.00	0.00	2,100.00

7 **Total Number Other Personnel**

Total Other Personnel 109,281.81

Total Salary, Wages and Fringe Benefits (A+B) 115,281.81

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	11,483.15
	Total Travel Cost	11,483.15

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	17,642.21
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	31,989.00
9.		
10.		
	Total Other Direct Costs	49,631.21

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	176,396.17

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		17,639.62
		Total Indirect Costs	17,639.62

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	194,035.79

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	194,035.79

L. Budget Justification

(Only attach one file.) 1268 KCRI _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850502437000O **Enter name of Organization:** Kilimanjaro Clinical Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Blandina		Yrbaga		60,000.00	1.20			6,000.00	0.00	6,000.00

Project Role: Co PI, Epidemiologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.20			2,400.00	0.00	2,400.00
0	Lab Technician	0.00			0.00	0.00	0.00
0	Nurse	0.00			0.00	0.00	0.00
0	Anthropologist/Epidemiologist	0.00			0.00	0.00	0.00
1	Finance	0.84			2,100.00	0.00	2,100.00
2	**Total Number Other Personnel**					**Total Other Personnel**	4,500.00

Total Salary, Wages and Fringe Benefits (A+B) 10,500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	0.00
	Total Travel Cost	0.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,917.22
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,917.22

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	13,417.22

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		1,341.72
		Total Indirect Costs	1,341.72

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,758.94

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,758.94

L. Budget Justification

(Only attach one file.) 1268 KCRI _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		30,000.00
Section B, Other Personnel		280,095.31
Total Number Other Personnel	25	
Total Salary, Wages and Fringe Benefits (A+B)		310,095.31
Section C, Equipment		
Section D, Travel		18,588.15
1. Domestic		
2. Foreign	18,588.15	
Section E, Participant/Trainee Support Costs		1,800.00
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel	1,800.00	
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		84,937.20
1. Materials and Supplies	42,281.53	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	42,655.67	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		415,420.66
Section H, Indirect Costs		41,542.07
Section I, Total Direct and Indirect Costs (G + H)		456,962.73
Section J, Fee		
Section K, Total Costs and Fee (I + J)		456,962.73

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561238912000O **Enter name of Organization:** One Health Coordination Desk Prime Ministers Office

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Justine		Assenga		3,000.00	1.00			250.00	0.00	250.00
Project Role:	Research Scientist, Molecular Epidemiologist										
Dr.	Jubilate		Bernard		3,000.00	1.00			250.00	0.00	250.00
Project Role:	Research Scientist, Public Health Specialist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 500.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	600.00
	Total Travel Cost	600.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	1,100.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		110.00
		Total Indirect Costs	110.00

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	1,210.00

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	1,210.00

L. Budget Justification

(Only attach one file.) 1269 OECD PMC_Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561238912000O **Enter name of Organization:** One Health Coordination Desk Prime Ministers Office

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Justine		Assenga		3,090.00	1.00			257.50	0.00	257.50
Project Role:	Research Scientist, Molecular Epidemiologist										
Dr.	Jubilate		Bernard		3,090.00	1.00			257.50	0.00	257.50
Project Role:	Research Scientist, Public Health Specialist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 515.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 515.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	618.00
	Total Travel Cost	618.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	1,133.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		113.30
		Total Indirect Costs	113.30

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	1,246.30

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	1,246.30

L. Budget Justification

(Only attach one file.) 1269 OECD PMC_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561238912000O **Enter name of Organization:** One Health Coordination Desk Prime Ministers Office

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Justine		Assenga		3,183.00	1.00			265.23	0.00	265.23
Project Role:	Research Scientist, Molecular Epidemiologist										
Dr.	Jubilate		Bernard		3,183.00	1.00			265.23	0.00	265.23
Project Role:	Research Scientist, Public Health Specialist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 530.46

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 530.46

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	636.54
	Total Travel Cost	636.54

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	1,167.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		116.70
		Total Indirect Costs	116.70

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	1,283.70

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	1,283.70

L. Budget Justification

(Only attach one file.) 1269 OECD PMC_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561238912000O **Enter name of Organization:** One Health Coordination Desk Prime Ministers Office

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Justine		Assenga		3,278.18	12.00			3,278.18	0.00	3,278.18
Project Role:	Research Scientist, Molecular Epidemiologist										
Dr.	Jubilate		Bernard		3,278.18	12.00			3,278.18	0.00	3,278.18
Project Role:	Research Scientist, Public Health Specialist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,556.36

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 6,556.36

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	655.64
	Total Travel Cost	655.64

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	7,212.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		721.20
		Total Indirect Costs	721.20

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	7,933.20

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	7,933.20

L. Budget Justification

(Only attach one file.) 1269 OECD PMC_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561238912000O **Enter name of Organization:** One Health Coordination Desk Prime Ministers Office

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Justine		Assenga		3,376.53	12.00			3,376.53	0.00	3,376.53
Project Role:	Research Scientist, Molecular Epidemiologist										
Dr.	Jubilate		Bernard		3,376.53	12.00			3,376.53	0.00	3,376.53
Project Role:	Research Scientist, Public Health Specialist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 6,753.06

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel **Total Other Personnel**

Total Salary, Wages and Fringe Benefits (A+B) 6,753.06

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	675.31
	Total Travel Cost	675.31

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	7,428.37

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		742.84
		Total Indirect Costs	742.84

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	8,171.21

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	8,171.21

L. Budget Justification

(Only attach one file.) 1269 OHCD PMC_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		14,854.88
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		14,854.88
Section C, Equipment		
Section D, Travel		3,185.49
1. Domestic		
2. Foreign	3,185.49	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		18,040.37
Section H, Indirect Costs		1,804.04
Section I, Total Direct and Indirect Costs (G + H)		19,844.41
Section J, Fee		
Section K, Total Costs and Fee (I + J)		19,844.41

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 233388961O000 **Enter name of Organization:** Public Health England Porton Down

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Roger		Hewson		142,920.00	0.10			1,191.00	0.00	1,191.00

Project Role: Scientific Leader

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 1,191.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Scientist	1.10			10,077.00	0.00	10,077.00
1	Project Manager	0.05			503.00	0.00	503.00
2	Technician	1.00			12,278.00	0.00	12,278.00
4	**Total Number Other Personnel**					**Total Other Personnel**	22,858.00

Total Salary, Wages and Fringe Benefits (A+B) 24,049.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	7,115.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	8,070.97
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	15,185.97

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	39,234.97

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	38.00		14,713.11
		Total Indirect Costs	14,713.11

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	53,948.08

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	53,948.08

L. Budget Justification

(Only attach one file.) 1270 PHE_Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		1,191.00
Section B, Other Personnel		22,858.00
Total Number Other Personnel	4	
Total Salary, Wages and Fringe Benefits (A+B)		24,049.00
Section C, Equipment		
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		15,185.97
1. Materials and Supplies	7,115.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees	8,070.97	
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		39,234.97
Section H, Indirect Costs		14,713.11
Section I, Total Direct and Indirect Costs (G + H)		53,948.08
Section J, Fee		
Section K, Total Costs and Fee (I + J)		53,948.08

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850495478000O **Enter name of Organization:** Tanzania Wildlife Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Julius	Dotto	Keyyu		30,000.00	1.00			2,500.00	0.00	2,500.00

Project Role: Research Scientist, Disease Ecologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 2,500.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Wildlife Technician	2.00			3,600.00	0.00	3,600.00

1 **Total Number Other Personnel**

Total Other Personnel 3,600.00

Total Salary, Wages and Fringe Benefits (A+B) 6,100.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	300.00
	Total Travel Cost	300.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	6,400.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		640.00
		Total Indirect Costs	640.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	7,040.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	7,040.00

L. Budget Justification

(Only attach one file.) 1271 TAWIRI_Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850495478000O **Enter name of Organization:** Tanzania Wildlife Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Julius	Dotto	Keyyu		30,900.00	1.00			2,575.00	0.00	2,575.00

Project Role: Research Scientist, Disease Ecologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 2,575.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Wildlife Technician	2.00			3,600.00	0.00	3,600.00

1 **Total Number Other Personnel**

Total Other Personnel 3,600.00

Total Salary, Wages and Fringe Benefits (A+B) 6,175.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	309.00
	Total Travel Cost	309.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	6,484.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		648.40
		Total Indirect Costs	648.40

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	7,132.40

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	7,132.40

L. Budget Justification

(Only attach one file.) 1271 TAWIRI_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850495478000O **Enter name of Organization:** Tanzania Wildlife Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Julius	Dotto	Keyyu		31,827.00	1.00			2,652.25	0.00	2,652.25

Project Role: Research Scientist, Disease Ecologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 2,652.25

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Wildlife Technician	0.00			0.00	0.00	0.00
1	**Total Number Other Personnel**					**Total Other Personnel**	0.00

Total Salary, Wages and Fringe Benefits (A+B) 2,652.25

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	318.27
	Total Travel Cost	318.27

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	2,970.52

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		297.05
		Total Indirect Costs	297.05

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	3,267.57

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	3,267.57

L. Budget Justification

(Only attach one file.) 1271 TAWIRI_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850495478000O **Enter name of Organization:** Tanzania Wildlife Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Julius	Detto	Keyyu		32,782.00	1.00			2,731.82	0.00	2,731.82

Project Role: Research Scientist, Disease Ecologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 2,731.82

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Wildlife Technician	0.00			0.00	0.00	0.00
1	**Total Number Other Personnel**					**Total Other Personnel**	0.00

Total Salary, Wages and Fringe Benefits (A+B) 2,731.82

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	327.82
	Total Travel Cost	327.82

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	3,059.64

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		305.96
		Total Indirect Costs	305.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	3,365.60

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	3,365.60

L. Budget Justification

(Only attach one file.) 1271 TAWIRI_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 850495478000O **Enter name of Organization:** Tanzania Wildlife Research Institute

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Julius	Dotto	Keyyu		33,765.00	1.00			2,813.77	0.00	2,813.77

Project Role: Research Scientist, Disease Ecologist

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 2,813.77

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Wildlife Technician	0.00			0.00	0.00	0.00
1	**Total Number Other Personnel**					**Total Other Personnel**	0.00

Total Salary, Wages and Fringe Benefits (A+B) 2,813.77

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	337.65
	Total Travel Cost	337.65

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	3,151.42

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		315.14
		Total Indirect Costs	315.14

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	3,466.56

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	3,466.56

L. Budget Justification

(Only attach one file.) 1271 TAWIRI_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		13,272.84
Section B, Other Personnel		7,200.00
Total Number Other Personnel	5	
Total Salary, Wages and Fringe Benefits (A+B)		20,472.84
Section C, Equipment		
Section D, Travel		1,592.74
1. Domestic		
2. Foreign	1,592.74	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		22,065.58
Section H, Indirect Costs		2,206.55
Section I, Total Direct and Indirect Costs (G + H)		24,272.13
Section J, Fee		
Section K, Total Costs and Fee (I + J)		24,272.13

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961235267000 **Enter name of Organization:** Tanzania Veterinary Laboratory Agency

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 1** **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Furaha		Mramba		36,000.00	1.00			3,000.00	0.00	3,000.00

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,000.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technician	1.00			450.00	0.00	450.00

3 **Total Number Other Personnel**

Total Other Personnel 450.00

Total Salary, Wages and Fringe Benefits (A+B) 3,450.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	120.00
	Total Travel Cost	120.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	5,570.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Overhead	10.00		557.00
		Total Indirect Costs	557.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	6,127.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	6,127.00

L. Budget Justification

(Only attach one file.) 1272 TVLA _Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961235267000 **Enter name of Organization:** Tanzania Veterinary Laboratory Agency

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Furaha		Mramba		37,080.00	1.00			3,090.00	0.00	3,090.00

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,090.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technician	1.00			463.50	0.00	463.50

3 **Total Number Other Personnel**

Total Other Personnel 463.50

Total Salary, Wages and Fringe Benefits (A+B) 3,553.50

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	120.00
	Total Travel Cost	120.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	5,673.50

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Overhead	10.00		567.35
		Total Indirect Costs	567.35

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	6,240.85

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	6,240.85

L. Budget Justification

(Only attach one file.) 1272 TVLA _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961235267000 **Enter name of Organization:** Tanzania Veterinary Laboratory Agency

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Furaha		Mrarba		38,192.00	6.00			19,096.20	0.00	19,096.20

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 19,096.20

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technician	12.00			5,728.86	0.00	5,728.86
1	ELISA Technician	12.00			5,000.00	0.00	5,000.00
1	PCR Technician	12.00			5,000.00	0.00	5,000.00
1	Tick ID Technician	12.00			7,200.00	0.00	7,200.00

6 **Total Number Other Personnel**

Total Other Personnel 22,928.86

Total Salary, Wages and Fringe Benefits (A+B) 42,025.06

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	1,620.00
Total Travel Cost	1,620.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	1,800.00
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	1,800.00

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	2,300.00
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Testing	123,893.33
9.	
10.	
Total Other Direct Costs	126,193.33

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	171,638.39

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Overhead	10.00		17,163.84
		Total Indirect Costs	17,163.84

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	188,802.23

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	188,802.23

L. Budget Justification

(Only attach one file.) 1272 TVLA _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 961235267000 **Enter name of Organization:** Tanzania Veterinary Laboratory Agency

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Furaha		Mramba		39,338.00	1.00			3,278.18	0.00	3,278.18

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,278.18

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technician	0.00			0.00	0.00	0.00
3	**Total Number Other Personnel**					**Total Other Personnel**	0.00

Total Salary, Wages and Fringe Benefits (A+B) 3,278.18

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	120.00
	Total Travel Cost	120.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	5,398.18

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Overhead	10.00		539.82
		Total Indirect Costs	539.82

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	5,938.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	5,938.00

L. Budget Justification

(Only attach one file.) 1272 TVLA _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 561235267000 **Enter name of Organization:** Tanzania Veterinary Laboratory Agency

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Furaha		Mramba		40,518.00	1.00			3,376.53	0.00	3,376.53

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,376.53

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technician	0.00			0.00	0.00	0.00
3	**Total Number Other Personnel**					**Total Other Personnel**	0.00

Total Salary, Wages and Fringe Benefits (A+B) 3,376.53

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	120.00
	Total Travel Cost	120.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	5,496.53

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Overhead	10.00		549.65
		Total Indirect Costs	549.65

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	6,046.18

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	6,046.18

L. Budget Justification

(Only attach one file.) 12?2 TVLA _Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		31,840.91
Section B, Other Personnel		23,842.36
Total Number Other Personnel	18	
Total Salary, Wages and Fringe Benefits (A+B)		55,683.27
Section C, Equipment		
Section D, Travel		2,100.00
1. Domestic		
2. Foreign	2,100.00	
Section E, Participant/Trainee Support Costs		1,800.00
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel	1,800.00	
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		134,193.33
1. Materials and Supplies	10,300.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	123,893.33	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		193,776.60
Section H, Indirect Costs		19,377.66
Section I, Total Direct and Indirect Costs (G + H)		213,154.26
Section J, Fee		
Section K, Total Costs and Fee (I + J)		213,154.26

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 229076096000 **Enter name of Organization:** University of Glasgow

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Sarah		Cleaveland		176,250.00	1.20			17,625.00	0.00	17,625.00
Project Role:	Co PI										
Dr.	Brian		Willett		136,020.00	0.60			6,801.00	0.00	6,801.00
Project Role:	Research Scientist, Viral Immunologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 24,426.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Administrator	1.20			7,560.00	0.00	7,560.00
1	Lab Technician	3.00			10,539.00	0.00	10,539.00
2	**Total Number Other Personnel**					**Total Other Personnel**	18,099.00

Total Salary, Wages and Fringe Benefits (A+B) 42,525.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	8,330.00
	Total Travel Cost	8,330.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	50,855.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		5,085.50
		Total Indirect Costs	5,085.50

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	55,940.50

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	55,940.50

L. Budget Justification

(Only attach one file.) 1273 UoG_Budget Justification.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 229076096000 **Enter name of Organization:** University of Glasgow

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Sarah		Cleaveland		182,500.00	1.20			18,249.98	0.00	18,249.98
Project Role:	Co PI										
Dr.	Brian		Willett		140,843.00	0.60			7,042.16	0.00	7,042.16
Project Role:	Research Scientist, Viral Immunologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 25,292.14

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Administrator	1.20			7,945.56	0.00	7,945.56
1	Lab Technician	3.00			11,082.81	0.00	11,082.81
2	**Total Number Other Personnel**					**Total Other Personnel**	19,028.37

Total Salary, Wages and Fringe Benefits (A+B) 44,320.51

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	11,721.40
	Total Travel Cost	11,721.40

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Lab Costs	19,500.00
9.		
10.		
	Total Other Direct Costs	19,500.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	75,541.91

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		7,554.19
		Total Indirect Costs	7,554.19

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	83,096.10

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	83,096.10

L. Budget Justification

(Only attach one file.) 1273 UoG_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 229076096000 **Enter name of Organization:** University of Glasgow

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Sarah		Cleaveland		188,969.00	1.20			18,896.94	0.00	18,896.94
Project Role:	Co PI										
Dr.	Brian		Willett		145,836.00	0.60			7,291.81	0.00	7,291.81
Project Role:	Research Scientist, Viral Immunologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 26,188.75

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Administrator	1.20			8,349.99	0.00	8,349.99
1	Lab Technician	12.00			46,626.72	0.00	46,626.72
2	**Total Number Other Personnel**					**Total Other Personnel**	54,976.71

Total Salary, Wages and Fringe Benefits (A+B) 81,165.46

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	19,002.47
	Total Travel Cost	19,002.47

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	3,500.00
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / Total Participant/Trainee Support Costs	3,500.00

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,651.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Lab Costs	19,500.00
9.		
10.		
	Total Other Direct Costs	22,151.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	125,818.93

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		12,581.89
		Total Indirect Costs	12,581.89

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	138,400.82

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	138,400.82

L. Budget Justification

(Only attach one file.) 1273 UoG_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 229076096000 **Enter name of Organization:** University of Glasgow

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Sarah		Cleaveland		195,668.00	1.20			19,566.84	0.00	19,566.84
Project Role:	Co PI										
Dr.	Brian		Willett		151,006.00	0.60			7,550.30	0.00	7,550.30
Project Role:	Research Scientist, Viral Immunologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 27,117.14

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Administrator	1.20			8,776.67	0.00	8,776.67
1	Lab Technician	12.00			49,057.37	0.00	49,057.37
2	**Total Number Other Personnel**					**Total Other Personnel**	57,834.04

Total Salary, Wages and Fringe Benefits (A+B) 84,951.18

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	16,112.89
	Total Travel Cost	16,112.89

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,651.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Lab Costs	19,500.00
9.		
10.		
	Total Other Direct Costs	22,151.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	123,215.07

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		12,321.51
		Total Indirect Costs	12,321.51

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	135,536.58

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	135,536.58

L. Budget Justification

(Only attach one file.) 1273 UoG_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 229076096000 **Enter name of Organization:** University of Glasgow

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Sarah		Cleaveland		202,605.00	1.20			20,260.49	0.00	20,260.49
Project Role:	Co PI										
Dr.	Brian		Willett		156,359.00	0.60			7,817.96	0.00	7,817.96
Project Role:	Research Scientist, Viral Immunologist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 28,078.45

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Administrator	1.20			9,225.16	0.00	9,225.16
1	Lab Technician	3.00			12,786.80	0.00	12,786.80
2	**Total Number Other Personnel**					**Total Other Personnel**	22,011.96

Total Salary, Wages and Fringe Benefits (A+B) 50,090.41

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	12,402.46
	Total Travel Cost	12,402.46

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	

Number of Participants/Trainees | **Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	62,492.87

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		6,249.29
		Total Indirect Costs	6,249.29

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	68,742.16

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	68,742.16

L. Budget Justification

(Only attach one file.) 1273 UoG_Budget Justification.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		131,102.48
Section B, Other Personnel		171,950.08
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		303,052.56
Section C, Equipment		
Section D, Travel		67,569.22
1. Domestic		
2. Foreign	67,569.22	
Section E, Participant/Trainee Support Costs		3,500.00
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel	3,500.00	
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		63,802.00
1. Materials and Supplies	5,302.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	58,500.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		437,923.78
Section H, Indirect Costs		43,792.38
Section I, Total Direct and Indirect Costs (G + H)		481,716.16
Section J, Fee		
Section K, Total Costs and Fee (I + J)		481,716.16

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 041485301000O **Enter name of Organization:** Washington State University

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 09/01/2019 **End Date:** 08/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Felix		Lankester		130,358.00	2.75			30,011.21	5,402.02	35,413.23

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 35,413.23

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Veterinarian	12.00			28,500.00	0.00	28,500.00
1	Human Field Assistant	6.00			6,000.00	0.00	6,000.00
1	Admin	1.00			2,000.00	0.00	2,000.00

3 **Total Number Other Personnel**

Total Other Personnel 36,500.00

Total Salary, Wages and Fringe Benefits (A+B) 71,913.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	45,000.00
	Total Travel Cost	45,000.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	9,920.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Permits	2,787.62
9.	Waste Management	525.00
10.	Equipment Insurance	1,000.00
	Total Other Direct Costs	16,232.62

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	133,145.85

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	26.00		34,617.92
		Total Indirect Costs	34,617.92

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	167,763.77

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	167,763.77

L. Budget Justification

(Only attach one file.) 1274 CCHF WSU budget justification v01 | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 041485301000O **Enter name of Organization:** Washington State University

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Felix		Lankester		130,358.00	2.75			30,011.21	5,402.02	35,413.23

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 35,413.23

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Veterinarian	12.00			28,500.00	0.00	28,500.00
1	Human Field Assistant	11.00			11,000.00	0.00	11,000.00
1	Admin	1.00			2,000.00	0.00	2,000.00
3	**Total Number Other Personnel**					**Total Other Personnel**	41,500.00

Total Salary, Wages and Fringe Benefits (A+B) 76,913.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	0.00
2.	Foreign Travel Costs	45,019.52
	Total Travel Cost	45,019.52

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	0.00
5.	Other	
	Number of Participants/Trainees / Total Participant/Trainee Support Costs	0.00

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	14,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Permits	2,871.25
9.	Waste Management	525.00
10.	Equipment Insurance	1,000.00
	Total Other Direct Costs	20,396.25

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	142,329.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	26.00		37,005.54
		Total Indirect Costs	37,005.54

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	179,334.54

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	179,334.54

L. Budget Justification

(Only attach one file.) 1274 CCHF WSU budget justification v01

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 041485301000O **Enter name of Organization:** Washington State University

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Felix		Dankester		130,358.00	2.75			30,011.21	5,402.02	35,413.23

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 35,413.23

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Human Field Assistant	0.00			1,000.00	0.00	1,000.00
1	Admin	1.00			2,000.00	0.00	2,000.00

2 **Total Number Other Personnel**

Total Other Personnel 3,000.00

Total Salary, Wages and Fringe Benefits (A+B) 38,413.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	10,994.51
	Total Travel Cost	10,994.51

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	2,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Permits	2,650.00
9.	Waste Mangement	0.00
10.	Equipment Insurance	1,000.00
	Total Other Direct Costs	7,650.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	57,057.74

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	26.00		14,835.01
		Total Indirect Costs	14,835.01

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	71,892.75

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	71,892.75

L. Budget Justification

(Only attach one file.) 1274 CCHF WSU budget justification v01

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 041485301000O **Enter name of Organization:** Washington State University

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Felix		Dankester		130,358.00	2.75			30,011.21	5,402.02	35,413.23

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 35,413.23

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Human Field Assistant	0.00			1,000.00	0.00	1,000.00
1	Admin	1.00			2,000.00	0.00	2,000.00

2 **Total Number Other Personnel**

Total Other Personnel 3,000.00

Total Salary, Wages and Fringe Benefits (A+B) 38,413.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	39,466.18
	Total Travel Cost	39,466.18

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	2,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Permits	2,729.50
9.	Waste Management	525.00
10.	Equipment Insurance	1,000.00
	Total Other Direct Costs	8,254.50

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	86,133.91

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	26.00		22,394.82
		Total Indirect Costs	22,394.82

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	108,528.73

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	108,528.73

L. Budget Justification

(Only attach one file.) 1274 CCHF WSU budget justification v01

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 041485301000000 **Enter name of Organization:** Washington State University

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Felix		Dankester		130,358.00	2.75			30,011.21	5,402.02	35,413.23

Project Role: Co PI

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 35,413.23

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Human Field Assistant	0.00			1,000.00	0.00	1,000.00
1	Admin	1.00			2,000.00	0.00	2,000.00

2 **Total Number Other Personnel**

Total Other Personnel 3,000.00

Total Salary, Wages and Fringe Benefits (A+B) 38,413.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: | Add Attachment |

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	13,494.52
	Total Travel Cost	13,494.52

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees	Total Participant/Trainee Support Costs

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	2,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Permits	2,811.39
9.	Waste Management	0.00
10.	Equipment Insurance	1,000.00
	Total Other Direct Costs	7,811.39

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	59,719.14

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	26.00		15,526.97
		Total Indirect Costs	15,526.97

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	75,246.11

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	75,246.11

L. Budget Justification

(Only attach one file.) 1274 CCHF WSU budget justification v01

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		177,066.15
Section B, Other Personnel		87,000.00
Total Number Other Personnel	12	
Total Salary, Wages and Fringe Benefits (A+B)		264,066.15
Section C, Equipment		
Section D, Travel		153,974.73
1. Domestic	0.00	
2. Foreign	153,974.73	
Section E, Participant/Trainee Support Costs		0.00
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence	0.00	
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		60,344.76
1. Materials and Supplies	10,000.00	
2. Publication Costs		
3. Consultant Services	29,920.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	13,849.76	
9. Other 2	1,575.00	
10. Other 3	5,000.00	
Section G, Direct Costs (A thru F)		478,385.64
Section H, Indirect Costs		124,380.26
Section I, Total Direct and Indirect Costs (G + H)		602,765.90
Section J, Fee		
Section K, Total Costs and Fee (I + J)		602,765.90

EcoHealth Alliance (EHA): Y1-5

A. Senior Personnel

We request a total of $466,612 to support co-PI/Key Personnel (KP) over the five years of the proposed project.

Melinda Rostal, DVM, PI, will commit 5 months ($42,315) per annum (p.a.) (Y1-OY2) with a 5% annual increase (due to the exceptionally high cost of living increases in New York City). She will coordinate the many partners involved in this collaboration. She will work with our Tanzanian colleagues to ensure all the proper permits, IACUC/IRB equivalents are submitted and approved. She will also manage the U.S.-based IACUC and IRB. She will make multiple trips to Tanzania, including for the annual meeting, meetings with local collaborators and local stake holders, to assist with community preparation prior to the start of the field work in Year 1 and Option Year 1 as well as to provide feedback to the communities, and one to conduct training and assist with the start of sampling. She will work closely with the field coordinator and Key Personnel (KP) on the various parts of the project and ensure all aspects of the project are progressing on schedule and effectively.

William B Karesh, DVM, co-PI, will commit 1 month of time p.a. in Y1-OY1. We request 1 month's (mo.) salary ($23,676) p.a. for co-PI Karesh, with a 5% increase p.a. PI Karesh will be very involved in the CCHF symposium that will be hosted and therefore we request 2 mo. salary in OY2 ($57,556). PI Karesh will meet with PIs, Key Personnel and senior governmental officials in Tanzania to initiate the project. He will work with Co-PI Rostal to coordinate the wide array of partners involved in this collaboration and promote stakeholder engagement.

Carlos Zambrana-Torrelio, PhD, will commit 0.5 mo. p.a. in Y1, Y3, OY1. We request 0.5 mo. p.a. ($4,961) for those years with a 5% increase p.a. KP Zambrana-Torrelio will advise on the ecological analyses and study design during the Y1, Y3 and OY1. KP Zambrana-Torrelio will commit 2 months in Y2 ($20,837) in order to analyze the environmental gradient data from the transects and the remote sensing data and 3 months in OY2 ($36,183) to mentor the post-doctoral fellow. In OY2 KP Zambrana-Torrelio will mentor the Tanzanian post-doctoral fellow in conducting the spatial analysis to identify correlates between environmental factors and CCHFV seropositivity.

B. Other Personnel

We request a total of $538,110 to support Other Personnel over the five years of the proposed project.

Field Coordinator, PhD will commit 12 months p.a. (Y1-OY1) to the project. We request $65,000 p.a. with a 5% annual increase. The field coordinator will spend a significant amount of time in Tanzania ensuring that the field, laboratory and training activities proceed smoothly. The field coordinator will interface directly with the students to ensure they gain experience in how to safely conduct field work. They will directly manage the field team for tick, animal and human sampling and will frequently communicate with community and collaborating partners. The coordinator will ensure that the capacity building activities and equipment purchases proceed smoothly and will help finalize and organize the training workshops and the participants who will attend.

Research and Operations Assistants. The research assistant will commit 5 months p.a. (Y1-OY2) to assist in the development of reports, coordination of collaborators, and data cleaning/maintenance and analysis. In Y1 we request $24,375 for salary for the research assistant, with a 5% annual increase. We will have an operations assistant committed to 3.5 mo. in Y1 and 2.0 mo. p.a. (Y2-OY2) thereafter. In Year 1 we request $16,247 of salary, with a 5% annual increase. In Y1 the operations assistant will need the additional time in order to initially establish and process the subcontracts with new partners. Once the subcontracts are established, the operations assistant will only need 2 mo. p.a. to maintain them and assist with communication among the collaborators, managing subcontracts and invoicing from the subcontractors.

In OY2 we request support for a Tanzanian post-doctoral fellow based at EcoHealth Alliance for the year. We request $65,000 p.a. for a 12-month fellowship in New York City with $20,456 of fringe (calculated at the rate of 31.47%).

Fringe Benefits

Fringe benefits are calculated as 31.47% of base salary for PIs, KPs and other project staff p.a. (not including student stipends), with $54,034 requested in Y1 and $314,652 over the full five years.

C. Equipment

We request $125,489 in Y1 to purchase equipment. We request $77,489 to fund a four-wheel drive vehicle for the project. As the project vehicle will be out in the field daily for most of Y1-OY1, it will be more cost effective for the project to purchase a vehicle rather than to rent one. We request $23,000 to purchase a generator for the TVLA Arusha laboratory. Currently, the laboratory does not have a generator and all laboratory work must cease during frequent power outages. More crucially, the samples collected for this project must remain frozen until PCR or serological assays can be conducted. Multiple freeze-thaw cycles would be very detrimental to the success in detecting CCHFV. We request $5,000 for a large centrifuge that can spin many blood tubes at once as human, livestock and small mammal sampling will be ongoing concurrently. Finally, we request $20,000 for a -80 ultra freezer to be installed at TVLA after the generator is installed. This will permit our samples to be maintained at the appropriate temperature (KCRI already has this capacity in their facility).

D. Travel

International Travel

All flights to/from Tanzania from/to New York City were calculated at $2,000 RT airfare to/from Arusha and $300 for flights from Arusha to Dar es Salam. Lodging and M&I for Arusha is $240 a day and $309 in Dar es Salam, and are within the federal guidelines for foreign travel per diem rates.

The following travel is requested on an annual basis:
PI Rostal will make two trips per year to the field site and to Dar es Salam to oversee field and laboratory work and meet with collaborators (Trip: $2,000 airfare + $1,680($240*7 days) + $300 airfare to Dar es Salam + $1,545($309*5 days) + $200 misc. travel costs ($100 per location) = $5,725*2 trips = $11,450). Co-PI Karesh will visit Tanzania once a year to meet with collaborators and join the Annual Stakeholders and Partners Meeting once in Y1- OY5 ($2,000

airfare + $2,163($309*7 days) + $100 misc. travel costs = $4,263). The field coordinator will make at least two trips per year, the time the coordinator will stay in the field each year will vary as described below (Trip: $2,000 airfare + $1,680 ($240*7 days) + $300 airfare to Dar es Salam + $1,545($309*5 days) + $200 misc. travel costs ($100 per location) = $5,725*2 trips = $11,450). In total this amounts to $27,163 p.a.

There is also a cost of $2,000 per person p.a. for a permit to enter Tanzania for the purpose of research. We are requesting $4,000 in Y1, for Dr. Rostal and the field coordinator to conduct research in Tanzania. This cost will increase at a rate of 3% per year to be included in international travel as well.

This provides a baseline of $31,163 per year (not including the 3% increase in the cost of permits per year).

U.S. Domestic Travel
The following is requested on an annual basis:
We are requesting $1,750 for PI Rostal or co-PI Karesh to attend the DTRA Annual Technical Review ($400 airfare/train + $1,250($250 lodging and M & I * 5 nights + $100 misc. travel costs = 1,750).

Year 1
International: $67,571
Domestic: $1,750

In Year 1, we request an additional trip with 14 days in Arusha and 7 in Dar es Salaam (to have additional meetings with government partners and be in the field as the project is starting) for PI Rostal at the same rate as described above (Trip: $2,000 airfare + $3,360 ($240 * 14 days) + $300 airfare to Dar es Salam + $2,163($309*7 days) + $200 misc. travel costs ($100 per location) = $8,023). Additionally, we request that one of the two baseline trips have an additional 6 days in Arusha ($240*6 = $1,440). For the field coordinator who will be spending time in the field with the team, we request an additional 14 days per trip in Arusha (14*$240 = 3,360*2 trips = $6,720) and two additional trips for 21 days in Arusha and with only one additional trip of 5 days in Dar es Salam (Trip 1: $2,000 airfare + $5,040($240 * 21 days) + $300 airfare to Dar es Salam + $1,545($309*5 days) + $200 misc. travel costs ($100 per location) = $9,085; Trip 2: $2,000 airfare + $5,040($240 * 21 days) + $100 misc. travel costs = $7,140).

We request funds for a permit to conduct research in a protected area (e.g. Serengeti), which costs $2,000 per person for Dr. Rostal and the field coordinator in Y1 and Y2, for a total of $4,000 in Y1.

Year 2
International: $78,513
Domestic: $6,350

In Year 2, we request one additional trips to the field site in Arusha and to Dar es Salaam (with 1 additional day in Dar es Salaam) for PI Rostal to have meetings with partners and ensure the field work is going smoothly at the same rate as described above (Trip: $2,000 airfare + $1,680 ($240*7 days) + $300 airfare to Dar es Salam + $1,854($309*6 days) + $200 misc. travel costs ($100 per location)= $6,034). For the field coordinator to support the field work, we request an additional 21 days per trip in Arusha (20*$240 = 4,800*2 trips = $9,600) and two additional trips to the field site in Arusha (for 27 days) with one of those including a trip to Dar es Salam for 4

days to meet with stakeholders (Trip 1: $2,000 airfare + $6,480($240*27 days) + $300 airfare to Dar es Salam + $1,236($309*4 days) + $200 misc. travel costs ($100 per location)= $10,216; Trip 2: Trip 1: $2,000 airfare + $6,480($240*27 days) + $100 misc. travel costs = $8,580). To ensure the environmental transects are being conducted correctly, we request KP Zambrana-Torrelio have one trip to Arusha in Y2. We request $3,780($2,000 airfare + $1,680($240*7 days) + $100 misc. travel costs). We also request funds to present the project at an international conference, estimated at $4,900 ($1,300 flight + $500 registration fee + $3,000($500 lodging and M & I * 6 days) + $100 misc. travel costs).

We also request funds to support presenting the project at two domestic conferences (Trip: $600 flight + $350 registration + $1,250($250 lodging and M&I * 5 days) + $100 misc. travel costs = $2,300 *2 = $4,600).

We request funds for a permit to conduct research in a protected area (e.g. Serengeti), which costs $2,000 per person for Dr. Rostal and the field coordinator in Y1 and Y2, for a total of $4,000 in Y2.

Year 3
International: $41,207
Domestic: $6,350

In Year 3, we request funds to present the project at two international conferences, estimated at $4,900 each ($1,300 flight + $500 registration fee + $3,000($500 lodging and M & I * 6 days) + $100 misc. travel costs), for a total of $9,800.

We also request funds to support presenting the project at two domestic conferences (Trip: $600 flight + $350 registration + $1,250($250 lodging and M&I * 5 days) + $100 misc. travel costs = $2,300 *2 = $4,600).

Option Year 1
International: $58,969
Domestic: $6,350

In Option Year 1, we request that PI Rostal have 3 additional days in Dar es Salaam to be able to join the team for the policy workshop, in addition to her regular meetings in Dar es Salaam. We request $927($309*3) in OY1 for this. Co-PI Karesh have a second trip to assist with the CCHF policy workshop in Dar es Salaam, thus we request $4,263($2,000 airfare + $2,163($309*7 days) + $100 misc. travel costs). To assist with the human incidence study, we also request that the field coordinator spend an additional 14 days during one trip to Arusha (14 additional days * $240 = $3,360) and that they may take one additional trip with 21 days in Arusha (Trip: $2,000 airfare + $5,040($240*21 days) + $300 airfare to Dar es Salam + $1,545($309*5 days) + $200 misc. travel costs ($100 per location) = $9,085). We also request funds to present the project at two international conferences, estimated at $4,900 ($1,300 flight + $500 registration fee + $3,000($500 lodging and M & I * 6 days) + $100 misc. travel costs) each, for a total of $9,800.

We also request funds to support presenting the project at two domestic conferences (Trip: $600 flight + $350 registration + $1,250($250 lodging and M&I * 5 days) + $100 misc. travel costs = $2,300 *2 = $4,600).

Option Year 2
International: $50,555
Domestic: $6,350

In Year 4, we request 1 additional day in Arusha on one trip for PI Rostal to have sufficient time to support community engagement and give final results and 2 extra days on each trip to Dar es Salaam (1*$240 + 2 days*$309*2 trips = $1,476). Co-PI Karesh have a second trip to assist with the East Africa CCHF symposium in Dar es Salaam, thus we request $4,263($2,000 airfare + $2,163($309*7 days) + $100 misc. travel costs). We also request that the research assistant and Key Personnel Zambrana-Torrelio may come to the CCHF in East Africa Symposium in Dar es Salam (Trip: $2,000 airfare + $2,163($309*7 days) + $100 misc. travel costs = $4,263 * 2 people = $8,526). The field coordinator will not make any trips this year, which is less (-)$11,450 from the annual travel baseline given above. We request that the Tanzanian post-doctoral fellow be permitted to make two trips to Tanzania during the year, one for the annual meeting and one for the CCHF Symposium (Trip: $2,000 airfare + $2,163 ($309*7 days) + $100 misc. travel costs = $4,263 * 2 trips = $8,526). We also request funds to present the project at two international conferences, estimated at $4,900 ($1,300 flight + $500 registration fee + $3,000($500 lodging and M & I * 6 days) + $100 misc. travel costs) for a total of $9,800.

We also request funds to support presenting the project at two domestic conferences (Trip: $600 flight + $350 registration + $1,250($250 lodging and M&I * 5 days) + $100 misc. travel costs = $2,300 *2 = $4,600).

E. Participant Support Costs

We request $54,710 in participant support costs during the five years.

CCHF Symposium

We request $54,710 to support a symposium on CCHF in East Africa in OY2. We request $1,500($510*2 nights in Dar es Salaam + $480 flight to Dar es Salaam) per person for 20 CCHF researchers or people interested in CCHF from East Africa ($30,000) and $3,530($510*3 nights in Dar es Salaam + $2,000 flight) per person for 7 international CCHF researchers ($24,710).

F. Other Direct Costs

Materials and Supplies
Y1: $66,773
In Y1, we request $32,103 to cover field supply costs. This includes enough cryovials, blood tubes, needles, syringes and vacutainer holders for the people, cattle, small mammals and ticks sampled and collected in the first year (which is half of the total number that will be sampled during the first cross-sectional study; $13,126). This also includes biosafety equipment for the team such as nitrile gloves (with extended cuffs) and biohazard bags (coveralls will be purchased locally and are under the GAH-T budget, $3,322). To conduct the surveys and bolster participation among cattle owners we request $7 per livestock animal to provide an incentive such as free deworming for that animal for the owners to have their cattle participate, we also request $2 per participant to provide a snack and juice box to participants that give a blood sample to prevent light-headedness after giving blood ($6,000), and we request funds to purchase 8 tablets on which to administer the questionnaires (8*$240 = $1,920). For small mammal trapping and anesthesia (in order to ethically obtain blood sample) we request $7,735, which will cover anesthetic supplies ($1,500) and the purchase of traps (50*$76.14 large Tomahawk traps for hares = $3,807; 30* $59.73 medium Tomahawk traps = $1,792.80; and 23*$27.6 Sherman traps for rodents = $634.80).

As these supplies will be purchased in the United States to ensure there are no delays to the project due to procurement we request $10,000 to cover shipping the supplies to Tanzania. We request $3,600 to purchase a label printer for the field team to ensure samples are properly marked and funds to purchase two theory computers and accessories (e.g. a computer bag, mouse or keyboard etc.) for the team to use on the project (2*$2000 = $4,000). This subtotal is $17,600.

We also request funds to support TVLA's laboratory infrastructure that do not meet the definition of equipment, we request $2,400 for a laboratory grade refrigerator, $120 for a thermometer for the new refrigerator, an ELISA plat reader lamp ($180), a sterial microscope ($3,600), a water distiller ($3,000), pH Meter ($120) and an ELISA washer ($2,400). We request $1,500 for supplies to support the project's student, $750 in miscellaneous costs and $3,000 in labels and printer ribbon for the label printer. This subtotal is $17,070.

Y2: $40,069
In Y2, we request $28,284 to cover field supply costs. This includes enough cryovials, blood tubes, needles, syringes and vacutainer holders for the people, cattle, small mammals and ticks sampled and collected in the second year (which is half of the total number that will be sampled during the first cross-sectional study; $13,490) with an anticipated 3% increase in the cost of supplies for each year. This also includes biosafety equipment for the team such as nitrile gloves (with extended cuffs) and biohazard bags (coveralls will be purchased locally and are under the GAH-T budget, $3,407). To conduct the surveys and bolster participation among cattle owners we request $7 per livestock animal to provide an incentive such as free deworming for that animal for the owners to have their cattle participate, we also request $2 per participant to provide a snack and juice box to participants that give a blood sample to prevent light-headedness after giving blood ($6,180), and we request funds to purchase 8 tablets on which to administer the questionnaires (8*$247.2 = $1,978). For small mammal trapping and anesthesia (in order to ethically obtain blood sample) we request $3,229, which will cover anesthetic supplies ($1,545) and the purchase of replacement traps (10*$78.42 large Tomahawk traps for hares = $784.24; 10* $61.55 medium Tomahawk traps = $615.53; and 10*$28.42 Sherman traps for rodents = $284.28).

As these supplies will be purchased in the United States to ensure there are no delays to the project due to procurement we request $5,150 to cover shipping the supplies to Tanzania. We request $2,000 to purchase a theory computer and accessories (e.g. a computer bag, mouse or keyboard etc.) for the team to use on the project. This subtotal is $7,150.

We request $1,545 for supplies to support the project's student, and $3,090 in labels and printer ribbon for the label printer; these costs reflect a 3% increase from the previous year. This subtotal is $4,635.

Y3: $4,683
In Y3, we request $1,500 to cover laboratory supplies purchased specifically for the workshop (e.g. cryovials, ELISA plates, Eppendorf tubes, pipette tips etc.).

We request $3,183 for supplies to support the project students; this cost reflects a 3% increase from the previous year. This subtotal is $3,183.

OY1: $36,890
In OY1, we request $22,120 to cover field supply costs. This includes enough cryovials, blood tubes, needles, syringes and vacutainer holders for resampling all of the people that were

sampled in Y1-Y2 ($16,711) with an anticipated 3% increase in the cost of supplies for each year. This also includes biosafety equipment for the team such as nitrile gloves (with extended cuffs) and biohazard bags (coveralls will be purchased locally and are under the GAHT budget, $2,836). To conduct the surveys, we request $2 per participant to provide a snack and juice box to participants that give a blood sample to prevent light-headedness after giving blood ($2,573).

As these supplies will be purchased in the United States to ensure there are no delays to the project due to procurement we request $5,464 to cover shipping the supplies to Tanzania. We request $2,000 to purchase a theory computer and accessories (e.g. a computer bag, mouse or keyboard etc.) for the team to use on the project. This subtotal is $7,464.

We request $3,278 for supplies to support two project's students, $3,278 in labels and printer ribbon for the label printer; these costs reflect a 3% increase from the previous year, and $750 in miscellaneous costs. This subtotal is $7,306.

OY2: $6,188
In OY2, we request $1,500 to cover supplies needed by the post-doctoral fellow for his/her project.

We request $3,000 to purchase a theory computer and accessories (e.g. a computer bag, mouse or keyboard etc.) with GIS and other required software for the Tanzanian post-doctoral.

We request $1,688 for supplies to support the project's student; this cost reflects a 3% increase from the previous year.

Publication Costs
We request $9,000 to cover the costs of publishing in open-access, peer-reviewed, scientific journals. We request $1,500 to publish one article per year in Y2-Y3 and $3,000 p.a. in OY1-OY2 to publish two articles per year.

Consultants
We requested funds for a Tanzanian-based PhD student to be supported by a stipend for $25,000 p.a. (Y1-Y3) to work for the project. The PhD student will contribute to the project through the completion of their research project. Three additional masters' level graduate students will be supported in subsequent years, each for 2 years at a rate of $15,000 p.a. ($90,000).

ADP / Computer Services
We requested $4,000 p.a. ($20,000) for communication costs, such as printing fees for reports for stakeholders and frequent communication with all partners and the field team. In OY2 we request $20,000 to cover the costs of server uses and back-ups in order to analyze the large satellite images and remote sensing data.

Subawards / Consortium / Contractual Costs
We request the following for each subcontractor in Y1 and over the total five years. For the details of justification please see the budget justification attached to each subaward below.

Kilimanjaro Clinical Research Institute: Y1 $66,440 for a total of $456,963.
One Health Coordination Desk – Prime Minister's Office: Y1$1,210 for a total of $19,844.
Public Health England: Y1$0 for a total of $53,948.
Tanzania Wildlife Research Institute: Y1$7,040 for a total of $24,272.
Tanzania Veterinary Laboratory Agency: Y1$6,127 for a total of $213,154.
University of Glasgow: Y1 55,941 for a total of $481,716.

Washington State University and Global Animal Health Tanzania: Y1$167,764 for a total of $602,766.

Other Stakeholder and Partners Meeting
We request funds to support a stakeholder and partners meeting in Dar es Salam, this includes the cost of the conference space and amenities, printing documents for the meeting. We request $10,000 p.a. for a total of $50,000 during the 5-year project.

We request $10,000 for the rental of the conference facilities for the CCHF Symposium in OY2.

Other – Recruitment
We request $7,500 to cover the costs of recruitment of the Tanzanian post-doctoral fellow in OY2 in order to cover the costs of the legal and visa filing fees associated with obtaining a work visa for the fellow. This will also cover moving expenses etc. that will need to be reimbursed to the fellow.

H. Indirect Costs

We are requesting the federally agreed indirect cost of 32.74% on all direct costs, which amounts to roughly $115,763-$156,398 p.a. We have applied this IC rate to the first $25,000 of the subcontracts valued over $25,000 p.a. ($25,000 x 5 subcontracts x 0.3274(%) = $40,925) and two subcontracts valued at a combined total of $44,117 ($44,117 x 0.3274(%) = $14,443) for a total of $55,369.

Washington State University &
WSU Global Animal Health Tanzania (GAHT)

A. Senior/Key Personnel

We request $177,066 to support Key Personnel over the five years of the proposed project.

Dr. Felix Lankester, Co-PI, will commit 2.75 months per year in each year of this project. We request an annual salary of $30,011 at 23% effort each year. Dr. Lankester is a Clinical Assistant Professor at Washington State University's Paul G. Allen School for Global Animal Health. Based in East Africa, Dr. Lankester has conducted zoonotic disease research since 2009 and has extensive experience with project leadership within the African and One Health research contexts. He serves as Country Representative of WSU's non-profit subsidiary Global Animal Health Tanzania (GAHT), legally registered in Tanzania to facilitate in-country research and support research capacity-building activities on zoonotic infectious diseases. Dr. Lankester will oversee all GAHT activities and supervise GAHT project staff, assist in the coordination of the field activities, serve as liaison with high level Ministerial collaborators and interested parties within the Government of the United Republic of Tanzania, and will collaborate with the PI on data analysis and the drafting of manuscripts, reports and policy documents.

Fringe Benefits
Fringe benefits are calculated as 18% of Dr. Lankester's base salary with $5,402 requested each year.

B. Other Personnel

We request $84,000 to support Other Personnel over the five years of the proposed project. WSU Global Animal Health Tanzania (GAHT) maintains an office to support its investigators with local hiring and payroll, procurement, accounting, vehicle maintenance, research permitting, and logistics. The GAHT office manages funds in-country using accounting software fully compliant with WSU's audited standards and with oversight by and regular reconciliations with WSU Allen School finance staff. No fringe benefits are requested for Other Personnel.

Veterinarian, (TBD) A Tanzanian registered veterinarian will be hired for the Animal Health team. She or he will commit 12 months (at 100% effort) per year in years 1 and 2 only. We request $28,500 for salary in each year. The veterinarian will lead the Animal Health team, coordinating activities such as the selection of households for sampling, collection of biological samples from livestock species, implementation of survey tools and the management and transportation of samples to the respective diagnostic laboratory facilities for analysis. In addition, the veterinarian will work with the wildlife sampling team from the Tanzanian Wildlife Research Institute to collect biological samples from wild herbivore species.

Field Assistant, (TBD) A field assistant on the Animal Health team will be required only in years 1 and 2. The field assistant will commit 6 months in year 1 and 11 months in year 2 with additional support of 1 month in year 3, option year 1, and option year 2. We request $6,000 for year 1 (50% effort); $11,000 for year 2 (100% effort); $1,000 in each year for years 3, option year 1, and option year 2 (8.3% effort, each). The responsibilities of the field assistant will include driving and maintaining road worthiness of the project vehicle and assisting the field teams during field sampling activities, and surveys.

Sarah Mollel, Project Administrator/Coordinator will commit 1.0 calendar month per year (8.3% effort) in each year of the project. We request $2,000 per year for Ms. Mollel. Administrative oversight for the proposed project will be provide by Ms. Mollel. This will include being responsible for the distribution of Tanzanian-based project funds, ensuring up-to-date accounting of all field expenses, liaising with Tanzanian review boards to ensure permits are in place and current, managing the road-worthiness of the field vehicles (insurance, servicing, repair work etc.) and organizing travel arrangements.

D. Travel

International Travel

Funds are requested for Dr. Lankester's travel to project meetings and project-related professional conferences at international locations outside of Tanzania. Two international trips outside of Tanzania across the 5-year project period are budgeted at $3255 in years 3 and option year 1: ($1,115 airfare from Arusha to Washington DC) + $1535 (5 nights x $307) + $480 (6 days * $80) meals and incidentals) + $125 for ground transportation). Totaling $6,510 over all of the years of the project.

International Travel - Domestic Travel in Tanzania

We request support for our local field team within Tanzania to conduct and oversee project activities. These include support for the project veterinarian and the field assistant on the Animal Health field team. We request $7,200 in years 1 and 2 to cover travel costs include lodging and per diem within Serengeti National Park. This will cover each of the two persons ($60/day x 60 days). This totals $14,400 over the two years.

We request $7,00 in year 1 and option year 1 each for two field personnel travel outside of Serengeti Park. Costs include lodging and per diem for two persons each in year 1 and option year 1 ($58.33/day x 60 days). This totals $14,000 over the two years.

We request $3,500 ($35/day*100 days) in years 1 and 2 totaling $7,000. Funds are also budgeted for the driver/field assistant travel in option year 1 to conduct the human incidence study ($40/day x 200 days = $8,000).

We request support to cover cost of project vehicle fuel for trips to field locations, totaling $13,888.97 in year 1. Mileage is calculated as 40,000 km/year in years 1 and 2 for the cross-sectional study; 26,667 km in option year 1 for the human incidence study; 24,000 km in years 2 and option year 2 for travel around Arusha for local meetings. Fuel is budgeted at $0.2083335/km for a total of $34,722.32 over the 5-years of our project.

An additional field vehicle will be required during portions of the field work to adequately accommodate project personnel and supplies. We request $6,840 to cover the vehicle rental for 38 days in years 1 and 2 each as well as an estimated 30 days in option year 1. We request $6,840 in year 1 ($190 x 38 days) for a total of $20,140 during the five years of our project.

The PhD student working on the project is estimated to have the following expenses for accommodation

- 40 days within Serengeti National Park in each of years 1, 2, and option year 1 ($60/day x 40 = $2,400 per year).
- 100 travel days outside the National Park in each of years 1, 2, and option year 1. We request $3,500 ($35/day x 100) in years 1, 2, and option year 1.
- Additional travel is requested in years 3 and option year 2 for only 2 months' time ($983.33 in each year).

Travel support within Tanzania is also requested for Dr. Lankester and for the Project Administrator. Dr. Lankester's travel includes:

- Community outreach to provide information on the study and share results. Cost per year is estimated at $1.906 ($546.18 for fuel + $1.200 ($60 x 20 days). Only two months are expected to be required in year 1 ($291.03) with 12 months required in all other years and 40 days per year ($60 x 40 = $2,400). The five year estimated cost is $12,075.75.
- 2 trips for 2 days each annually to Dar es Salaam and Dodoma for meetings with United Republic of Tanzania Ministry officials and other stakeholders for our project. The cost per trip is calculated at $525 ($300 flight + $450 for lodging and MIEs estimated at $225 x 2 days) x 2 = $1,050 x 2 = $2,100 each year for only years 2, 3, and option years 1 and 2 - totaling $8,400 for the five years.

- 4 trips for 3 days each in years 2 and option year 1 to field sites to supervise and evaluate the field activities and sampling procedures. The average per trip cost is $555 ($375 flight + $540 for lodging and MIEs estimated at $180 x 3 days) x 4 trips = $2,220 in each of years 2 and option year 1 totaling $4,440. Two additional trips are estimated for years 3 and option year 2 at $1,110 per year.

- Project Administrator Sarah Mollel will require occasional travel for purposes of securing research permits, procurement, assisting with outreach activities and other project-related duties. We estimate this at $600 per year in years 2, 3, and option years 1 and 2 with $2,400 requested for the full 5-year period.

E. Participant Support Costs

No participant support costs requested.

F. Other Direct Costs

- *Materials and Supplies ($10,000.00)*
  We request $2,000.00 per year to support purchase of materials and supplies. These annual expenses will be required for community outreach and field supplies including printer paper (10 reams at $7.00 each = $70), toner (4 cartridges for CMYK at $150 each with an extra K or black cartridge, since most printing will be in black and white = $750), field notebooks (at $10 two each for ten field personnel = $200), dedicated field coveralls ($22 each for 10 field personnel with two back-up coveralls per field team personnel = $660), buckets (at $8 each with a total of 15 estimated to be used during the sampling year = $120), and disinfectants ($50 per bottle and 4 required for the field sampling year = $200).
- *Consultant Services ($25,920)*
  - We request support for a consultant with expertise in mammalogy and species identification. She or he will be contracted to aid in identification of rodents and other mammal species captured in the live animal traps. Biological samples collected from these animals before they are released will be assayed for virus which will enable reservoirs and vectors of the CCHF virus to be determined. Consequently, accurate species identification is critical. The current annual rate for these services is estimated at $6,000. We will require only 9 months of this service in year 1 (prorated to 66% -> $3,960) and 12 months in year 2 (100% time -> $6000).

  - We request support for translation services and estimate these at $2,000 per year = $10,000). These translation services will pay for translation of survey tools from English into Swahili and vernacular tribal languages. Translation services will be sourced in Arusha town.

  - We request support for the field team vehicle maintenance including tire replacement, minor repairs, oil changes, other regular services. We estimate these at $6,000 per year and only require them in years 1 and 2 during field activities. In year 1 and as the vehicle will be new, we request only 9 months' coverage (66%) $3,960 and $6,000 in year 2 for maintenance during the cross-sectional study during which the field vehicle will be frequently required for field work. The vehicle will primarily be used to go back and forth between the laboratories in Moshi and Arusha, as well as to the communities for meetings with community leaders.
- *Other – Permits ($13,849.75)*
  We request funding for annual Tanzanian work permits for Dr. Lankester. We estimate this cost in year one at $2,787 with a 3% increase per year in each of the five years of the project to account for inflation and exchange rate fluctuations.
- *Other – Medical Waste Management ($1,575.00)*

We have estimated medical waste management for biohazardous waste disposal at $1,575 with an annual cost of $525 in each year of field work, so only in years 1, 2, and option year 1.

- *Other – Equipment Insurance ($5,000.00)*
  Insurance coverage for field vehicles and for project (field and laboratory) equipment is estimated at $1,000 per year

H. Indirect Costs

WSU's off-campus federally negotiated and approved research rate for indirect costs is 26% of all allowable direct costs. We request a total of $124,425.83 over the five years of our proposed project.

Public Health England-Porton Down Budget Justification

A. Senior Personnel

We request a total of $1,191 to support Key Personnel (KP) during the project.

Roger Hewson, Ph.D, Scientific Leader, Virologist will commit 0.1 months in OY2 of the project. KP Hewson will engage with project partners, supervise and oversee scientific reporting from PHE. We request a total of $1,191.

B. Other Personnel

We request a total of $22,858 to support Other Personnel during the proposed project.

Stuart Dowall, Ph.D, Senior Scientist, Virologist will commit 1.1 months in OY2 of the project. KP Dowall will set up DEFRA license applications for sample transport and liaise with colleagues in Tanzania on sample details, plan and supervise the containment level 4 activity, collate data and lead the scientific reporting. We request a total of $10,077

Technicians: Kevin Richards, Ph.D and James Pitman. Two experienced CL4 laboratory virologists will commit 1 month each in OY2 in order to confirm 100 wildlife samples using virus neutralization assays. CCHFV is a Hazard Group 4 pathogen necessitating work with infectious substances to be carried out at Containment Level 4, and the UK operates a dual worker or buddy system for all laboratory work with HG4 pathogens. We request $6,139 per person per month for a total of $12,278 for both.

Project Manager: Neil McLeod. The project manager will commit 0.05 months in OY2 in order to manage staff and budgets to ensure efficient project progress. We request $503 in OY2.

F. Other Direct Costs

We request a total of $15,190 for direct costs during the project.

Materials and Supplies

We will conduct 100 CCHFV virus neutralization assays to confirm the positive ELISA results on the wildlife samples, as this has not previously been assessed for this multispecies commercial ELISA. This includes the cost of running the test as well as laboratory supplies such as petri dishes, culture media, reagents, tubes etc. We request $7,119 in OY2 to procure these supplies and conduct the testing.

6. Facility Rental

CCHFV is a Hazard Group 4 pathogen necessitating work with infectious substances to be carried out at Containment Level 4. We request $8,071 in OY2 to support the use of the CL-4 laboratory for 2 weeks in order to complete the testing indicated above.

H. Indirect Costs

We are requesting the federally agreed indirect cost of 37.5% on all direct costs during the project. We request $14,715 in OY2.

University of Glasgow (UoG)

A. Senior Personnel

We request a total of $131,107 to support co-PI/Key Personnel (KP) over the five years of the proposed project.

Sarah Cleaveland, Ph.D., co-PI, will commit 1.2 months (mo.) per annum (p.a.) for all five years, with an increase of approximately (allowing for exchange rates) 3.4% annually. We request $17,625 in Y1 and $94,600 total. Co-PI Cleaveland will provide key support and oversight for the field epidemiological studies by contributing to the design and implementation of the field study, liaising with partner institutions and stakeholders in Tanzania and linking with policy makers at national, regional and international levels for the dissemination of findings and development of guidelines.

Brian Willett, Ph.D., Research Scientist, Viral Immunologist, will commit 0.6 mo. p.a. for all five years with an increase of approximately 3.4% annually. We request $6,801 in Y1 and $36,507for all five years. Key Personnel Willett will provide oversight, support and training for CCHFV serological and molecular analyses and will coordinate activities with collaborating laboratories (Public Health England, Pirbright Institute).

B. Other Personnel

We request a total of $171,950 to support Other Personnel over the five years of the proposed project.

Technician. A full-time laboratory technician based in KP Willett's laboratory will commit 3 mo. per year in Y1, Y2, and OY1. We request $10,539 in Y1 with an approximately (allowing for exchange rates) 4.8% increase annually (the other personnel are paid on a Grade 5 scale vs the Senior Personnel that are paid on a professional scale at Glasgow). The technician will commit 12 mo. per year in Y3 and OY1 as the in-country laboratory work will be conducted during these two years. We request $46,627 in Y3, totalling $130,092 across all five years. The laboratory technician will support the laboratory analyses, including optimisation of assays, and establishment of laboratory diagnostic capacity in Tanzania.

John Claxton, Administrator, will commit 1.2 months p.a. for all five years with an approximately (allowing for exchange rates) 4.8% increase annually. We request $7,560 in Y1 and a total of $41,857 for all five years. Mr. Claxton, a highly experienced international project manager, will provide support for financial management and reporting, sub-contracts and agreements, ethical clearance, procurement and shipment of supplies.

D. Travel

We request a total of $63,032 for international travel across all five years.

We request 2 trips per year for either co-PI Cleaveland or the laboratory technician in Y1-OY1. Each trip is estimated at a $1,300 flight + $700($70 x 10 days for food and lodging in Arusha) + $480(flight to Dodoma or Dar es Salaam) + $300($150 x 2 days for food and lodging in Dar es Salaam) = $2,780. We request $5,560 in Y1 with a 3% increase in costs per year for a total of $23,260 across four years.

In Y3 and OY1 we request an additional $28.52 per day for the technician to an extended stay (about 6 months and 2 months respectively) in Tanzania to support the laboratory assays and establishment of diagnostic capacity (this amount covers rental costs for staying at the UoG research house at KCMC-KCRI). We request $5,305($28.52 x 186 days) to cover this extended stay in Y3 and $1,974 ($28.52 x 67.2 days x 3% increase) in OY1, totalling $7,279.

In OY2 we request 2 trips to for co-PI Cleaveland and 1 trip for KP Willett. As this year will be more focused on building relationships, co-PI will spend more time in Dar es Salaam and less time in Arusha. For co-PI Cleaveland we request trip 1: $3,035($1,300 flight + $280($70 x 4 days) + $380 flight to Dar es Salaam + $750($150*5)*12% increase from Y1; trip 2: $3,360($1,300 flight + $420($70 x 6 days) + $380 flight to Dar es Salaam + $900($150*6) *12%; and for KP Willett to join the CCHF Symposium $2,890 ($1,300 flight + $380 flight to Dar es Salaam + $900($150*6)*12% increase from Y1. For a total of $9,285.

We request $23,525 over five years for research visas. We request a permit for the technician in Y1 to assist with the installation of capacity building equipment at TVLA, 2 permits per year in Y2-OY1 for the technician and co-PI Cleaveland and one permit in OY2 for co-PI Cleaveland. We request $2,770 in Y1 with a 3% increase across all years.

E. Participant Support Costs

We request $3,500 in Y3 for travel subsistence costs for participants ($50 per day * 5 days * 10 participants *2 trainings). Costs for the UoG trainer are covered by travel costs.

F. Other Direct Costs.

We request a total of $63,830 in other direct costs across 5 years.

In Y3 and OY1 we request $2,650 with a 3% increase p.a. for the shipment of samples from Tanzania to the University of Glasgow. This is required for quality assurance of assays carried out in Tanzania and based on recent estimates for similar shipments provided by Arusha Freight.

Lab work

We request a total of $58,500 for laboratory work across the 5 years. Materials and consumables costs are based upon the average actual annual expenditure (over 4 years) by researchers within this laboratory performing similar experiments to those in the project. These costs were extracted from the University of Glasgow purchasing system Agresso. All consumables purchased benefit from significant bulk purchase discounts negotiated centrally with major suppliers including Thermo Fisher, QIAgen, and VWR International.

We request a total of $18,322 over the five years for immunologicals and viral detection. We request $3,862 in Y2-OY1 ($4,038 total; $1,700 in Y2, $479 in Y3 and $2,410, which averages at $1,346 p.a. but is adjusted to account for the number of kits purchased per year as indicated below) for the purchase and production of the human ELISA reagents, including antibody reagents, secondary antibody conjugates, specific control sera, buffers, blocking agents and substrates for ELISA. This will produce sufficient reagent to facilitate ELISA analyses at KCRI, UoG and the laboratories participating in the workshops. These funds will also be used to purchase of sufficient CCHF Multispecies ELISA kits (430 animals can be tested per kit) at the end of Y2 for analyses at TVLA on the 3,200 animal samples in Y3 ($1,205 per kit * 7 kits = $8,435), and a contingency of kits sufficient to process an additional 1000 samples in each of Y4 ($1,205 per kit * 3 kits = $3,615) and Y5 (2 kits = $2,410) for confirmatory analyses and assay validation at UoG. Thus, we request a sufficient number of kits to test 5,200 samples over the three years (5,200/430 = 12 kits * $1,205 = $14,460.

We request a total of $22,049 over the five years for cell culture plasticware/media for the synthesis and purification of recombinant antigens (for the human ELISA). This includes culture flasks, plates, media and supplements, ELISA plates, plate sealers, reservoirs, pipettes, tips and tubes. This includes using pre-cast polyacrylamide gels, buffers and supplies for the iBlot transfer system, Sarstedt tubes and storage boxes for sera. We request $3,322 in Y2 to prepare sufficient reagent for KCRI to begin testing at the start of Y3 and

increasing to $9,364 p.a. in Y3 and OY1 for full production to be used by KCRI, given to the laboratories participating in the training and for UoG to confirm the results in 1000 samples.

We request $3,504 p.a. in Y2-OY1 for a total of $10,511 over the five years for molecular biologicals, nucleic acid purification kits, restriction enzymes and kits for mutagenesis and sequencing for vector preparation and cloning, and transfection. Also included in this category are preparing primers and probes for viral detection by real-time PCR for TVLA to use, confirmatory testing primers for sub-cloning and mutagenesis, and small-scale sequence confirmation of plasmid constructs.

We request $2,539 p.a. (Y2-OY1) for general laboratory supplies, including microcentrifuge tubes, plates, petri dishes, fine chemicals, and general laboratory costs.

H. Indirect Costs

We request a total of $43,792 in overhead, a rate of 10% per year on other direct costs, over the five years of the proposed project.

TVLA Budget Justification

A. Senior Personnel

We request a total of $28,563 to support Key Personnel over the five years of the proposed project.

Dr. Furaha Mramba, Co-PI, Entomologist, will commit 1 months per year. We request salary of $3,000 in Year 1, with a 3% increase for Y2-Y5, respectively. Her time with increase in Y3 to 6.0 months in order to support the testing of samples in the TVLA laboratory. Co-PI Mramba is the Chief Executive of TVLA and holds a PhD in medical entomology. Co-PI Mramba will conduct or supervise the identification and diagnostic testing of animals and ticks, oversee the design, implementation and analysis of the animal study and facilitate communication with stakeholders.

B. Other Personnel

We request a total of $23,842 to support Other Personnel over the five years of the proposed project.

Laboratory Technicians.

There will be three technicians, who will who commit 1 months per year in Y1 and Y2 to assist with the installation of the equipment purchased for the TVLA laboratory in Arusha (e.g. generator for the building, an ultrafreezer – see the EcoHealth Alliance Y1 part C for a full list of items to be installed), for which we are requesting $450. Salaries will increase of 3% in subsequent years. They will commit to 12 months per year for Y3 in order to assist with the diagnostic testing of samples. For this we are requesting $6,642.36 over the five years of the project.

During Year 3 we will hire three additional technicians to conduct the diagnostic testing of samples and tick identification. This includes one ELISA technician and one PCR technician that will be based in Arusha and who will commit 12 months per year for Y3 to assist with sera and ticks, respectively, for which we request $5,000 per technician. The technician hired to identify ticks will be contracted for 12 months from the TVLA lab in Tanga, for which we request $7,200.

D. Travel

We request a total of $2,100 to support travel over the five years of the proposed project.

In order to complete the tick identifications in Y3 of the project, we request $1,140 that will cover six 14-day trips to Arusha. Transportation is calculated at $50 per day ($50/day x 6 trips = $300) and overnights are calculated at an average cost of $10 per day, for 6 trips of 14 days each ($10/day x 14 days x 6 trips = $840).

Co-PI Mramba will require one trip per year during Y1, Y2, OY1, and OY2 for project meetings and to visit stakeholders, calculated at $50 per day for transportation, and $10 per day for 7 days for field visit ($120 per year). During Y3 when there is active laboratory work and tick identifications ongoing, co-PI Mramba will make 3 additional trips to visit the laboratory in Arusha, for which we are requesting $480 in Y3.

E. Participant Support Costs

We request a total of $1,800 for a CCHF Diagnostics Training Workshop held at TVLA during Y3 of the project. These funds will be used to support the travel costs of the trainees during the 5-day workshop.

F. Other Direct Costs

We request a total of $134,193 for other direct costs over the five years of the proposed project.

We request $123,893 for testing during Y3 of the project, including PCR testing and serology. We request $30,656 for PCR testing covering 1,200 cattle samples, 1,800 small mammal samples and 200 wildlife samples, at a discounted rate of $9.58 (the rate is discounting as the University of Glasgow is providing the multispecies ELISA kits for analysis). We request $93,238 for serology testing covering 200 wildlife samples and 3296 tick pools, at a cost of 60,000 Tanzanian Shilling, or $26.67 USD, per test.

We request $10,300 over the five years of the project for supplies. There will a cost of $2,000 each year in fuel for the generator to maintain samples (which will begin to be collected in Year 1) at -80°C during power outages. In Y3 only, we request $300 for a 100 pack of 20 mL Petri dishes.

H. Indirect Costs

We request a total of $19,378 in overhead, a rate of 10% per year on other direct costs, over the five years of the proposed project.

KCRI Budget Justification

A. Senior Personnel

We request a total of $38,000 to support Key Personnel over the five years of the proposed project.

Blandina Mmbaga, Co-PI, Epidemiologist, will commit 1.2 months per year. We request salary of $6,000 in Year 1-Y5. Co-PI Mmbaga will commit 2.8 months per year in OY1 as we will have both human field sampling and lab testing ongoing. Co-PI Mmbaga is the Research Director of KCRI and holds a PhD in Public Health and Epidemiology. Co-PI Mmbaga will contribute to the study design, lead the implementation of field work with human subjects and the laboratory analysis of human samples, provide training and mentorship, develop policy recommendations and facilitate collaboration with stakeholders.

B. Other Personnel

We request a total of $288,095.31 to support Other Personnel over the five years of the proposed project.

Technicians. We request $2,000 per year in Y1-2 for a laboratory technician, who will commit 1 months per year to aliquot the serum samples that come in from the field and store them. In Y3 of project, the laboratory technician will increase their time commitment to 12 months per year, and a second laboratory technician will be hired committing 12 months per year, for which we are requesting $24,000 per technician for Y3-4 to complete the ELISA testing on the human sera collected in Y1, Y2 and OY1.

Nurses. We request $48,000 over the five years of the project for two nurses. In Y1-2, we request support for one nurse who will commit 6 months per year at a rate of $12,000 per year who will collect blood samples from participants in the serosurvey (Task 2). In OY1 of the project, we request $24,000 for two nurses who will each commit 6 months for the year in order to collect blood samples for the incidence study.

Administrator. We request $2,400 in Y1 to support a Program Administrator who will assist co-PI Mmbaga in the administration of the project. We request a total of $12,000 over the five years of the project.

Anthropologist/Epidemiologist. We request $30,000 for an Anthropologist/Epidemiologist, with a 3% increase in subsequent years, who will commit 12.0 months Y1-2, OY1 and 6 months in Y3 to contribute to the development of the serosurvey and incidence studies, field data collection and data analysis.

We request $10,500 over the five years of the project to support a Finance Specialist who will commit .84 months per year for Y1-5. The Finance Specialist will work with project staff to ensure timely invoicing for all program expenses.

D. Travel

We request $3,500 per year, with a 3% annual increase, for Year 1 and 2 and $11,483 in OY1 for travel. This will cover a travel stipend of $35 per day for 100 days in each of Y1 and Y2 for the original serosurvey and 150.5 days in OY1 for the incidence study for the nurse(s) while they are working in the field. We request $18,588 over the five years.

E. Participant Support Costs

We request a total of $1,800 for a CCHFV Diagnostics Training Workshop Y3 of the project. We will host a workshop to train participants from local and national public health laboratories to conduct CCHFV ELISA and PCR testing as well as to understand the importance of including CCHFV as a differential diagnosis.

F. Other Direct Costs

We request a total of $84,948.19 for other direct costs over the five years of the proposed project.

We request $2,400 for the storage of samples in Y1 of the project, and an increase of 5% in each subsequent year for a total of $13,261.52 over the five years of the project. We request $14,156.10 for laboratory access and utilization for the processing of human IgG ELISA samples in Y3 of the project, and an increase of 5% in Y4 for a total of $29,020.01 over the five years of the project. There is a separate cost to perform the tests, for which we request a total of $42,656, $10,667 in Y3 to perform 800 tests and $31,989 in Y4 to perform 2400 tests all at a cost of 30,000 Tanzanian Shilling, or $13.33 USD, per test.

H. Indirect Costs

We request a total of $40,484 in overhead, a rate of 10% per year, over the five years of the proposed project.

One Health Coordination Desk (OHCD-PMO) Budget Justification

A. Senior Personnel

We request a total of $14,855 to support Key Personnel over the five years of the proposed project.

Dr. Justine Assenga, Research Scientist, Molecular Epidemiologist, will commit 1.0 months per year for which we request salary support of $250 in Year 1, with a 3% increase per annum (p.a.). Dr. Justine Assenga is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk and will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Assenga's time will increase from 1 month to 12 months per year in Y4-5 for a total of $7,427 over the five years of the project.

Dr. Jubilate Bernard, Research Scientist, Public Health Specialist, will commit 1.0 months per year for which we request salary support of $250 in Year 1, with a 3% increase p.a. Dr. Jubilate Bernard is the Animal Health Focal Person at the Ministry of Livestock and Fisheries One Health Coordination Desk will join meetings, assist with keeping the government ministries apprised of our activities, contribute to the development of the epidemiological plan as well as facilitate communication to stakeholders. In order to prepare for and facilitate the policy workshop and CCHF Symposium, Dr. Bernard's time will increase from 1 month to 12 months per year in Y4-5 for a total of $7,427 over the five years of the project.

D. Travel

We request a total of $3,185 to support local travel for them in Tanzania over the five years of the proposed project.

We request $600 in Y1 for so that both Dr. Assenga and Dr. Bernard may attend project meetings held in Tanzania and take other meetings to improve One Health stakeholder relationships. Travel expenses will increase at a rate of 3% per year over the five years of the project.

H. Indirect Costs

We request a total of $3,185 in overhead over the five years of the project. The rate of overhead will be 10% each year, starting with $110 in Y1.

TAWIRI Budget Justification

A. Senior Personnel

We request a total of $13,273 to support Key Personnel over the five years of the proposed project.

Julius Dotto Keyyu, Ph.D., Research Scientist, Disease Ecologist, will commit 1.0 months per year. We request salary of $2,814 in Year 1, with a 3% increase for Y2-Y5, respectively. Dr. Julius D. Keyyu is a Chief Research Officer who holds a PhD in ecosystem and population health specifically on disease ecology. Dr. Keyyu will support the wildlife sampling team, create the animal epidemiological study design, implementation and analysis and facilitate communication with stakeholders.

B. Other Personnel

We request a total of $7,200 to support Other Personnel over the five years of the proposed project.

Wildlife Technician. There will be one wildlife technician, who will support the team while they are sampling small mammals in the protected area. They will be paid $60 per day for food an accommodation, each working for 60 days ($60 x 60 days x 2 years) for a total of $7,200, for Year 1 and Year 2 of the project.

D. Travel

We request a total of $1,593 to support local travel in Tanzania over the five years of the proposed project.

We request $300 in Y1 for Key Personnel Keyyu to join project meetings and meet with stakeholders. Local travel expenses will increase at a rate of 3% per year throughout the project.

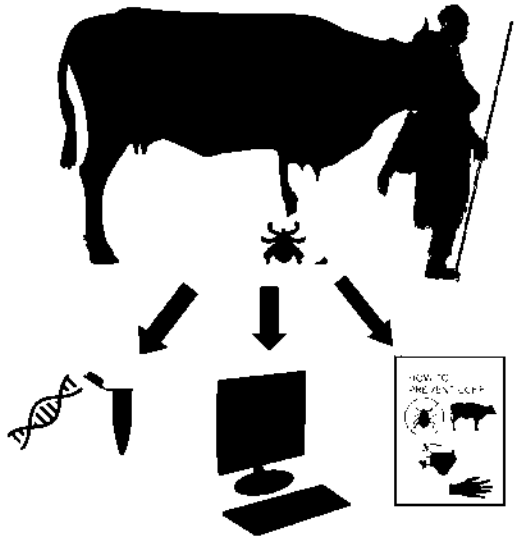
H. Indirect Costs

We request a total of $22,066 in overhead, a rate of 10% per year on other direct costs, over the five years of the proposed project.

Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania, PI: Melinda Rostal, EcoHealth Alliance, GRANT12759679

Objective: Conduct the first collaborative One Health investigation of Crimean-Congo hemorrhagic fever virus (CCHFV) in Tanzania to estimate current seroprevalence of CCHFV in people, cattle and wildlife, identify risk factors associated with seroprevalence and develop threat reduction policy recommendations for the government of Tanzania.

Method: Work with local partners and government to scientifically investigate CCHFV infection patterns in people, animals, vector ecology and ecological determinants to improve awareness in local communities, the government and among the medical and research community in Tanzania and recommend policies to reduce the threat of CCHF outbreaks.



Status of effort: The collaborative team has been established and already generated preliminary data.

Personnel Supported: We plan to support 20 researcher scientists, 8 technicians, 1 Post-Doc, and 4 graduate students.

Publications & Meetings: We plan to publish at least 6 peer-reviewed articles and present at at least 10 meetings.

Major Goals and Milestones:

- Raise awareness about CCHF within communities, health laboratories and government (Y1-OY2).
- Estimate the seroprevalence in humans, cattle and wildlife and the prevalence in ticks (Y1-3).
- Build capacity through laboratory diagnostic and policy workshops, and an international CCHF symposium.

Funding Profile Yr 1: $997,801 Yr 2: $927,086 Yr 3: $992,671 OYr 1: $999,748 OYr 2: $931,177

Contact information PI: Dr. Melinda Rostal, rostal @ecohealthalliance.org, 1-212-380-4489; Co-PI: Dr. William Karesh, karesh@ecohealthalliance.org, 1-212-380-4463

Statement of Work

Project Title: Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania

Document Date: March 18, 2018.

Objective: The objective of this grant is to reduce the threat of Crimean-Congo hemorrhagic fever (CCHF) by determining the presence and scale of CCHF virus (CCHFV) circulation in Tanzania. The awardee shall establish a multi-disciplinary team of Tanzanian and international One Health professionals to collect fundamental data on CCHFV, conduct rigorous scientific analyses and support the Government of Tanzania in the development of policies to control and reduce the threat of CCHF. Using a One Health approach the awardee shall investigate the following three hypotheses: 1) CCHFV is circulating in ticks, livestock and wildlife in Tanzania; 2) CCHFV is present and circulating in the human population in Tanzania; 3) CCHFV prevalence, seroprevalence and vector abundance will vary across an environmental disturbance gradient from peri-urban communities, to pastoral rangelands, to protected wildlife areas. The awardee shall support the capacity of Tanzanian human and animal health laboratories to detect anti-CCHFV antibodies, train Tanzanian field researchers and provide vital data to Tanzanian government partners and stakeholders to develop policies to prepare for and reduce the threat of a CCHF outbreak.

Scope: The grantee proposes a five-year multi-disciplinary study of epidemiology, ecology and impact of CCHF in northern Tanzania. The grantee team shall focus on the following major goals and milestones:

- Improve awareness of and capacity to respond to potential CCHF epidemics.
    - Host an annual stakeholders' and partners' meeting in Tanzania (Y1-OY2); initiate and maintain diagnostic capacity for detection of CCHFV (Y2-OY1); provide training for students and scientists (Y1-OY2).
- Use a One Health approach to identify CCHFV infection patterns in wildlife, cattle and humans across an environmental disturbance gradient.
    - Establish field study protocols (Y1); implement small mammal, cattle and human serosurveys (Y1-2); conduct serological assays on blood samples (Y3-OY1); conduct longitudinal study in humans (OY1); train a Tanzanian post-doctoral fellow to use spatial analyses to determine environmental correlates of CCHFV infection risk (OY2).
- Determine the abundance and CCHFV infection prevalence of tick vectors.
    - Establish tick field study protocols (Y1); implement tick sampling (Y1-2); conduct PCR assays on *Hyalomma* spp. ticks (Y3); analyze tick abundance in relation to environmental factors (Y3).
- Support One Health communication and policy development to reduce the threat of CCHF.
    - Host a policy development workshop (OY1); host an East African CCHF symposium (OY2).

Background: Crimean-Congo hemorrhagic fever is a **WHO Blueprint R&D priority disease** for which **there is an urgent need for accelerated research** given its **epidemic potential and the lack of countermeasures against CCHFV**. The Department of Health and Human Services considers CCHF as having the potential to pose a **severe threat to human health**. Similarly, **Tanzania identified viral hemorrhagic fevers as one of six priority zoonoses of greatest national concern**. Clinical signs and symptoms include fever, headache, thrombocytopenia, hemorrhagic disease and death in 30-40% of patients. CCHFV can be transmitted via multiple routes, including direct contact with infected animal tissues and transmission from *Hyalomma* spp. ticks. Human-to-human transmission has frequently been reported and if isolation practices are not implemented, nosocomial outbreaks can occur. Though it is not known to cause disease in animals, CCHFV circulates among both small mammals and large ruminants. Little is known about the status of CCHFV in Tanzania as the most recent cattle serosurvey occurred in 1974-75 (identifying a 9% seroprevalence) and despite neighboring Uganda and Kenya reporting multiple cases, no studies have investigated CCHF in humans in Tanzania.

Similar to the situation with Ebola virus prior to the 2014-16 outbreak, CCHFV antibodies were detected in people in Turkey as far back as 1980, yet no cases were reported until the start of the large outbreak in 2002-06 during which there were 1,103 confirmed cases. This "sudden" appearance of CCHF has been described in many regions that thereafter remain endemic for the virus, including Pakistan, Crimea and Turkey. **Human epidemics have often been linked to environmental and social changes,** which are associated with an increase in the abundance of CCHFV vectors. Thus using a One Health approach is vital to understanding CCHFV ecology, particularly in regions where environmental changes might drive disease emergence. CCHF is a frequent threat faced by U.S. warfighters working in endemic countries in Central Asia and the Middle East. Indeed, war is considered a driver for the emergence of CCHF as demonstrated by the outbreak among 200 Soviet troops in Crimea.

Key references include (further references can be found in the Project Narrative):

Pigott, D. M. et al. Local, national, and regional viral haemorrhagic fever pandemic potential in Africa: a multistage analysis. The Lancet 390, 2662-2672 (2017).

Messina, J. P. et al. The global distribution of Crimean-Congo hemorrhagic fever. Trans R Soc Trop Med Hyg 109, 503-513 (2015).

Hoogstraal, H. The epidemiology of tick-borne Crimean-Congo hemorrhagic fever in Asia, Europe, and Africa. J Med Entomol 15, 307-417 (1979).

Tasks/Scientific Goals: (given in the format: Year.Task.Subtask)

Task Y1.1-YO2.1: Improve the capacity within Tanzania to understand the potential impacts of CCHF and strengthen One Health collaborations between sectors.
Strengthening Tanzania's capacity to consider CCHF as a differential diagnosis, conduct CCHFV diagnostic assays and improve inter-sector communication about this important zoonosis will improve their ability to identify, respond and prevent CCHF outbreaks. 1) The grantee shall mentor four graduate students or FETP fellows in fields that can contribute to our understanding of the epidemiology and ecology of CCHFV in Tanzania (Y1-OY2). 2) The awardee shall provide equipment to TVLA to permit them to sustainably maintain the sample cold chain and diagnostic workflow (e.g. a generator and an ultrafreezer) in Y1. 3) The awardee

shall train all field and laboratory staff (based on what is pertinent for their role) in: biosafety, safe and humane handling of animals, ethical conduct of research with human subjects, biosecurity, etc. in Y1, Y3 and OY1. 4) Through the annual meetings (Y1-OY2), additional meetings throughout the year and communication among stakeholders and between project partners the project shall strengthen the communication between relevant One Health sectors. 5) As the grantee knows of no laboratories conducting CCHFV diagnostics in Tanzania, the awardee shall provide intensive training in the use of serological and polymerase chain reaction (PCR) based assays for the diagnosis of CCHFV (Y3-OY1). The awardee shall select an assay for testing humans that requires recombinant antigen that would be possible to produce in country or in a neighboring country in order to improve the sustainability of the establishment of these assays at diagnostic laboratories in Tanzania. The awardee shall conduct two laboratory workshops on the importance of CCHFV and its diagnosis (Y3). 6) Following a majority of the field and laboratory work, the awardee shall host a policy workshop to present the results to an invited group of government and non-government representatives and using those results develop and provide a set of policy recommendations for the reduction of the threat of CCHFV in Tanzania to the Government of Tanzania (OY1). 7) The awardee shall train one Tanzanian post-doctoral fellow in the spatial ecology of infectious diseases at EcoHealth Alliance in New York City (OY2). 8) The awardee shall host a symposium on CCHF in East Africa and invite global leaders in CCHF research to exchange ideas on additional research that is needed, ways of increasing support for the growing group of CCHF experts in East Africa and ideas about the applicability of control measures being used in other regions that may be transferable to the situation in East Africa (OY2).

1.1.1-OY2.1.1 Train a minimum of four graduate students in fields related to CCHFV.
1.1.2-Y3.1.2 Strengthen the capacity of the Arusha Regional TVLA laboratory.
1.1.3-OY1.1.3 Train staff *in situ* in epidemiological field methods.
1.1.4-OY2.1.4 Support One Health relationships between partners and stakeholders.
1.1.5-OY1.1.5 Support laboratory capacity to conduct CCHFV diagnostics.
3.1.6 Host one workshop on diagnostic testing for CCHFV at each KCRI and TVLA.
OY1.1.7 Host a workshop to support CCHF policy development in Tanzania.
OY2.1.8 Mentor a Tanzanian post-doctoral fellow in spatial ecology of infectious diseases.
OY2.1.9 Host East African CCHF Symposium.

Task Y1.2-YO1.2: Determine CCHFV infection patterns, risk factors and incidence in humans.

To identify and characterize the risk of infection with CCHFV in people within the study area in northern Tanzania the grantee shall conduct several epidemiological studies. Despite the lack of CCHF outbreaks reported in Tanzania, there are confirmed cases of CCHF in neighboring Uganda and Kenya, the vector is present in Tanzania and we have previously identified circulating antibodies in livestock within the proposed study area. In order to confirm our hypothesis that CCHFV does infect people in Tanzania, the grantee shall 1) finalize IRB approvals in the U.S. and obtain the required permits and ethical approvals in Tanzania (Y1). 2) The awardee shall conduct a cross-sectional study approximately 1,586 people. People who

enroll shall be given a questionnaire in Swahili and asked to provide a blood sample (Y1-Y2). 3) Laboratory testing using an enzyme linked immunosorbent assay (ELISA) will be conducted at KCRI in Y3-OY1. A subset of samples will be shipped to UoG for confirmation. 4) A preliminary analysis of initial results of the human serosurvey will be completed in Y3 and reported with the results from the animal serosurveys (Y3). 5) In OY1 we will re-sample all willing participants to determine the incidence of CCHFV infection within the sampled population. These samples will be tested at KCRI as described in subtask 1.2.3.

1.2.1 Obtain local permissions and approvals to work with human subjects.
1.2.2-OY1.2.2 Conduct a cross-sectional study in people within the study area.
3.2.3-OY1.2.3 Conduct serological assays for the presence of anti-CCHFV antibodies.
3.2.4-OY1.2.4 Analyze human serosurvey results.
OY1.2.5 Conduct incidence sampling among cross-sectional study participants.

Task Y1.3-Y3.3: Determine CCHFV infection patterns in cattle across varying environments.

The grantee shall conduct a cross-sectional study in cattle (and other animals, see Task 4) throughout the pastoral livestock and peri-urban areas of the study area to determine whether there is a difference in seroprevalence. 1) The awardee shall finalize the U.S. IACUC approvals and obtain all appropriate permits and ethical approvals required in Tanzania (Y1). 2) The grantee shall collect blood samples and ticks from cattle in Y1-Y2. The grantee shall use conduct an environmental disturbance assessment transect at each site to complement remote sensing data to establish the disturbance levels across the study area. 3) The collected ticks will be identified at TVLA by an experienced entomologist (Y3). 4) Cold chain will be maintained and the serum samples will be transferred to TVLA for analysis with the ID Screen® CCHF Double Antigen Multi-Species ELISA by IDVet. The ticks shall be tested for CCHFV via PCR at TVLA (Y3). A subset of samples shall be shipped to UoG for confirmation. 5) The cattle serosurvey results shall be analyzed and reported at the end of Y3.

1.3.1 Obtain local permits and permissions.
1.3.2-3.3.2 Conduct a cross-sectional serosurvey in cattle across two levels of environmental disturbance.
3.3.3 Collect and identify *Hyalomma spp.* ticks from sampled cattle.
3.3.4 Conduct laboratory analyses on cattle ticks and sera.
3.3.5 Analyze cattle serosurvey results.

Task Y1.4-OY2.4: Determine CCHFV seroprevalence and infection patterns in wildlife and ticks.

Using a One Health approach the grantee shall conduct a cross-sectional study to compare the tick burden, CCHFV seroprevalence (in wildlife only) and CCHFV prevalence (in ticks only) across three different levels of environmental disturbance: peri-urban, pastoral livestock and protected areas. 1) The awardee shall finalize the U.S. IACUC approvals and obtain all appropriate permits and ethical approvals required in Tanzania (Y1). 2) The awardee shall trap small mammals at the sites where people and livestock are also being sampled as well as in the protected area (Y1-Y2). 3) The grantee shall also conduct tick transects to collect ticks from the vegetation (Y1-Y2). The cold chain shall be maintained and samples will be transferred to TVLA. 4) Ticks shall be speciated by an experienced TVLA technician. 5) Serum samples shall

be tested with the multispecies CCHFV ELISA kit. *Hyalomma* spp. ticks shall be tested for CCHFV by PCR (Y3). 6) The grantee shall work with partner TAWIRI to access banked serum and ticks collected from wild ruminants in protected areas (Y3). 7) The awardee shall complete and analysis and report of the wildlife serosurvey results at the end of Y3. 8) Since the multispecies ELISA has not been validated using seropositive sera from wildlife (it has been assessed in seropositive livestock samples) the grantee shall transfer 100 samples to PHE for confirmation using the gold standard CCHFV virus neutralization assay (OY2).

1.4.1 Obtain local permits and permissions.
1.4.2-2.4.2 Conduct cross-sectional study in small mammals.
1.4.3-2.4.3 Collect ticks from vegetation at study sites.
3.4.4 Identify ticks collected from small mammals and transects.
3.4.5 Conduct laboratory analyses for CCHFV antibodies and viral RNA.
3.4.6 Test banked serum from wild ungulates.
3.4.7 Analyze wildlife serosurvey results.
OY2.4.8 Confirm seropositive wildlife samples with virus neutralization assays.

Task Y1.5-OY2.5: Disseminate reports to relevant stakeholders.

The awardee shall synthesize all research and capacity building activities described above and 1) An Annual Research Performance Progress Report, Quad Chart and Metrics will be submitted to DTRA and the project shall submit the Annual Sample Repository information using a DTRA-specified format (Y1-OY2). Quarterly reports shall also be submitted as requested by DTRA. 2) An annual report shall be made to local stakeholders. 3) A stakeholder meeting shall be held annually to describe the project and the current results. Community feedback meetings shall be held to provide aggregate findings and engage with local stakeholders through the project. 4) Scientific and general reports shall be generated and presentations of findings shall be made at national and/or international meetings (e.g. ASM, ASTHM, IMED, One Health etc.) as indicated in the performance schedule below. The grantee shall attend the Annual Technical Review when invited to the review by DTRA. 5) Samples will be maintained in biobanks at KCRI and TVLA, with a subset of duplicated samples stored at UoG and PHE following confirmatory testing of these samples (Y1-OY2). Access to all samples collected and data generated during the course of the project will be maintained, up to and including at least 12 months after the project end date. 6) In Y3 a synthetic report on the cross-sectional studies will be submitted to DTRA. These dissemination pathways shall provide opportunities to gain stakeholder input, including to inform policy to reduce the threat of CCHF in Tanzania. The awardee shall submit a Research Performance Final Report and submit a Final Metrics File at the end of the entire project period.

1.5.1-OY2.5.1 Submit reports, including sample repository data, to DTRA.
1.5.2-OY2.5.2 Complete annual report to local stakeholders.
1.5.3-OY2.5.3 Host annual partners' and stakeholders' meeting.
1.5.4-OY2.5.4 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
1.5.5-OY2.5.5 Maintain samples in biobanks.
3.5.6 Complete reports on results of human, cattle and wildlife cross-sectional studies and comparison across the gradient.

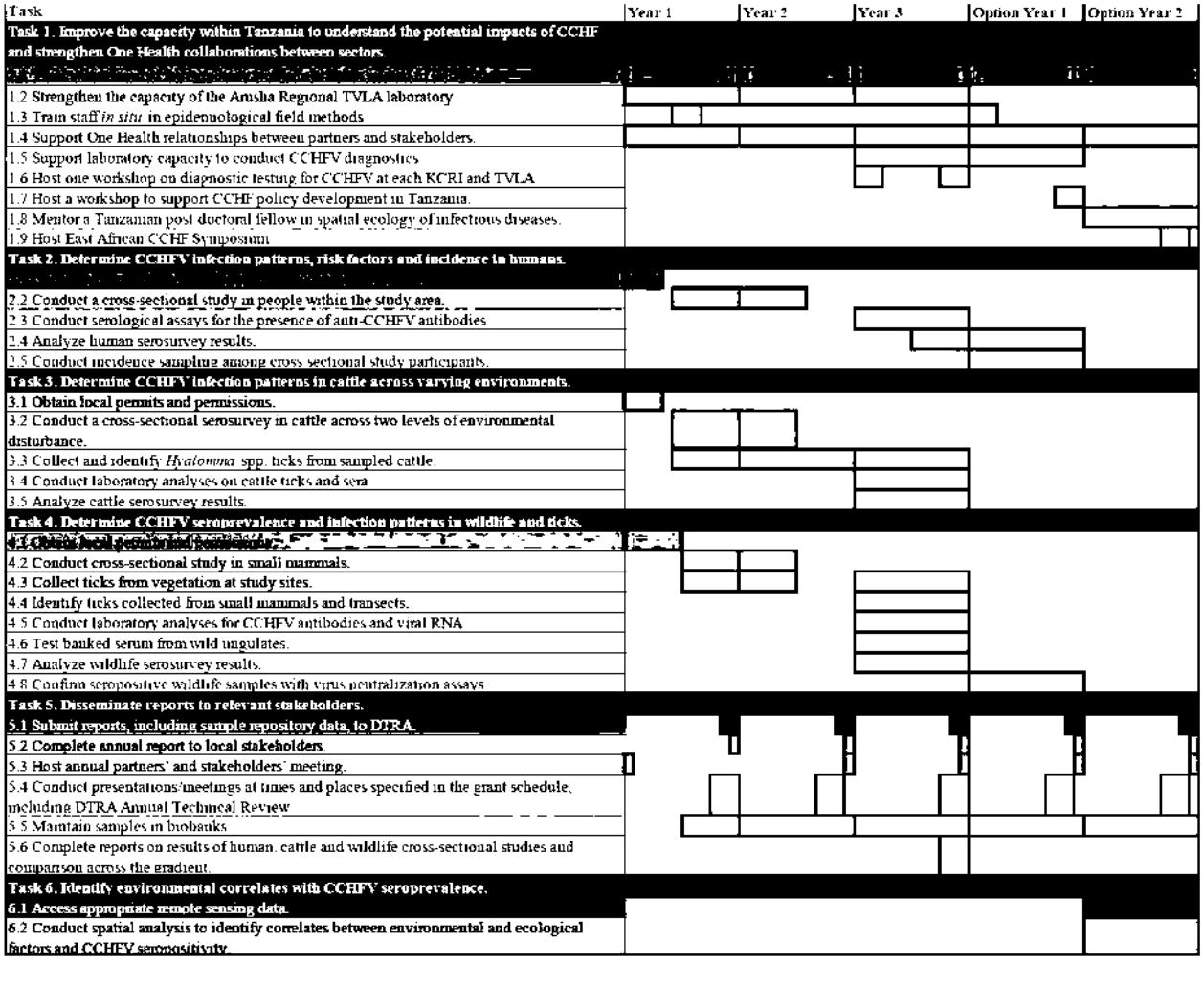
Task OY2.6: Identify environmental correlates with CCHFV seroprevalence.

The grantee shall 1) access remote sensing data sets including the following remote sensing products: NASA's ECOSTRESS data (ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station) that provides data on vegetation water stress and LandSat data, as well as remote sensing derived data such as normalized difference vegetation index (NDVI) and enhanced vegetation index (EVI). 2) Spatially explicit correlates shall be performed to understand the relationship between environmental factors and seropositivity in humans, livestock and wildlife as well as vector and viral prevalence.

OY2.6.1 Access appropriate remote sensing data.

OY2.6.2 Conduct spatial analysis to identify correlates between environmental and ecological factors and CCHFV seropositivity.

Performance Schedule:



OMB Number: 4040-0001
Expiration Date: 10/31/2019

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION

☐ Pre-application ☒ Application ☐ Changed/Corrected Application

2. DATE SUBMITTED | **Applicant Identifier**

4. a. Federal Identifier

b. Agency Routing Identifier

c. Previous Grants.gov Tracking ID

5. APPLICANT INFORMATION

Organizational DUNS: 077090060000

Legal Name: EcoHealth Alliance

Department: | Division:

Street1: 460 W 34th St

Street2: Suite 1701

City: New York | County / Parish:

State: NY: New York | Province:

Country: USA: UNITED STATES | ZIP / Postal Code: 10001-2302

Person to be contacted on matters involving this application

Prefix: Dr. | First Name: Melinda | Middle Name:

Last Name: Rostal | Suffix:

Position/Title: Senior Research Scientist

Street1: 460 W 34th St

Street2: 17th Floor

City: New York | County / Parish:

State: NY: New York | Province:

Country: USA: UNITED STATES | ZIP / Postal Code: 10001-2302

Phone Number: 2123804489 | Fax Number: 2123804465

Email: rostal@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION *(EIN) or (TIN)*: 311726494

7. TYPE OF APPLICANT: M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Other (Specify):

Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION:

☒ New ☐ Resubmission

☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).

☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration

☐ E. Other (specify):

Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. NAME OF FEDERAL AGENCY: Defense Threat Reduction Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 12.351

TITLE: Scientific Research: Combating Weapons of Mass Destruction

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:

Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania

12. PROPOSED PROJECT:

Start Date: 09/01/2019 | Ending Date: 08/31/2024

13. CONGRESSIONAL DISTRICT OF APPLICANT

NY-010

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name: Melinda Middle Name:
Last Name: Rostal Suffix:
Position/Title: Senior Research Scientist
Organization Name: Ecohealth Alliance
Department: Division:
Street1: 460 W 34th St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2302
Phone Number: 2123804460 Fax Number: 2123804465
Email: rostal@ecohealthalliance.org

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	4,848,483.14
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	4,848,483.14
d. Estimated Program Income	0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR
☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ **I agree**

**The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL (Disclosure of Lobbying Activities) or other Explanatory Documentation

Add Attachment

19. Authorized Representative

Prefix: Dr. First Name: Aleksei Middle Name:
Last Name: Chmura Suffix:
Position/Title: Authorized Organizational Representative
Organization: Ecohealth Alliance
Department: Division:
Street1: 460 W 34th St.
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2302
Phone Number: 2123804460 Fax Number: 2123804465
Email: chmura@ecohealthalliance.org

Signature of Authorized Representative: Aleksei Chmura

Date Signed: 03/19/2019

20. Pre-application Add Attachment

21. Cover Letter Attachment 1234-Rostal Cover letter CCHF Phase II_DATE Delete Attachment View Attachment

RESEARCH & RELATED Other Project Information

OMB Number: 4040-0001
Expiration Date: 10/31/2019

1. Are Human Subjects Involved? ☒ Yes ☐ No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

If no, is the IRB review Pending? ☒ Yes ☐ No

IRB Approval Date:

Human Subject Assurance Number:

2. Are Vertebrate Animals Used? ☒ Yes ☐ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☒ Yes ☐ No

IACUC Approval Date:

Animal Welfare Assurance Number:

3. Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. Does this Project Have an Actual or Potential Impact - positive or negative - on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. Does this project involve activities outside of the United States or partnerships with international collaborators? ☒ Yes ☐ No

6.a. If yes, identify countries: Tanzania, United Kingdom

6.b. Optional Explanation:

7. Project Summary/Abstract 1235-CCHF Project Summary- Public Abs | Delete Attachment | View Attachment

8. Project Narrative 1236-CCHF Technical proposal 2019_Fin | Delete Attachment | View Attachment

9. Bibliography & References Cited 1237-REFERENCES.pdf | Delete Attachment | View Attachment

10. Facilities & Other Resources | Add Attachment

11. Equipment | Add Attachment

12. Other Attachments Add Attachments

OMB Number: 4040-0001
Expiration Date: 10/31/2019

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Dr. * First Name: Melinda Middle Name:
* Last Name: Rostal Suffix:
Position/Title: Senior Research Scientist Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2302
* Phone Number: 2123804460 Fax Number: 2123804465
* E-Mail: rostal@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** PD/PI **Other Project Role Category:**

Degree Type: PhD
Degree Year: Expected 2019

***Attach Biographical Sketch**	1241-Rostal_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1242-Rostal_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 1

Prefix: Dr. * First Name: William Middle Name: Bamberger
* Last Name: Karesh Suffix:
Position/Title: Executive VP for Health and Policy Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2302
* Phone Number: 2123804463 Fax Number: 2123804465
* E-Mail: karesh@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

Degree Type: DVM
Degree Year: 1982

Attach Biographical Sketch	1243-Karesh_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1244-Karesh_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 2

Prefix: Dr. * First Name: Sarah Middle Name:

* Last Name: Cleaveland Suffix:

Position/Title: Professor Department:

Organization Name: University of Glasgow Division:

* Street1: Glasgow G12 8QQ

Street2:

* City: Glasgow County/ Parish:

* State: Province:

* Country: GBR: UNITED KINGDOM * Zip / Postal Code:

* Phone Number: +44 (0) 784 1248374 Fax Number:

* E-Mail: sarah.cleaveland@glasgow.ac.uk

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

Degree Type: PhD

Degree Year: 1996

Attach Biographical Sketch	1245-Cleaveland_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1246-Cleaveland_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 3

Prefix: Dr. * First Name: Furaha Middle Name:

* Last Name: Mrarba Suffix:

Position/Title: Chief Executive Department:

Organization Name: Tanzania Veterinary Laboratory Agency Division:

* Street1: Mandela Road

Street2:

* City: Dar es Salaam County/ Parish:

* State: Province:

* Country: TZA: TANZANIA, UNITED REPUBLIC OF * Zip / Postal Code:

* Phone Number: +255 22 2861152 Fax Number:

* E-Mail: furaha58@yahoo.com

Credential, e.g., agency login:

*** Project Role:** Co PD/PI **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2006

Attach Biographical Sketch	1247 Mrarba_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1248 Mrarba_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 4

Prefix: Dr. * First Name: Blandina Middle Name: Theophil

* Last Name: Mmbaga Suffix:

Position/Title: Research Director Department:

Organization Name: Kilimanjaro Clinical Research Institute Division:

* Street1: PO Box 2236

Street2:

* City: Moshi County/ Parish:

* State: Province:

* Country: TZA: TANZANIA, UNITED REPUBLIC OF * Zip / Postal Code:

* Phone Number: +255 27 2754201 Fax Number:

* E-Mail: b.mmbaga@kcri.ac.tz

Credential, e.g., agency login:

*** Project Role:** Co-PD/PI **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2013

Attach Biographical Sketch	1249-Mmbaga_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1250-Mmbaga_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 5

Prefix: Dr. * First Name: Felix Middle Name:

* Last Name: Lankester Suffix:

Position/Title: Assistant Professor Department:

Organization Name: Washington State University Division:

* Street1: 1155 College Ave

Street2:

* City: Pullman County/ Parish:

* State: WA: Washington Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 99164 0001

* Phone Number: (509) 335-2489 Fax Number:

* E-Mail: felix.lankester@wsu.edu

Credential, e.g., agency login:

*** Project Role:** Co PD/PI **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2016

Attach Biographical Sketch	1251 Lankester_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1252 Lankester_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 6

Prefix: Dr. * First Name: Carlos Middle Name:

* Last Name: Zambrana-Torrelio Suffix:

Position/Title: Associate VP for Conservation and Health Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2302

* Phone Number: 2123804466 Fax Number:

* E-Mail: zambrana@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Research Scientist, Ecologist

Degree Type: PhD

Degree Year: 2017

Attach Biographical Sketch	1253-Zambrana_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1254-Zambrana-Torrelio_C&P.pd		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 7

Prefix: Dr. * First Name: Brian Middle Name: James

* Last Name: Willett Suffix:

Position/Title: Professor of Viral Immunology Department:

Organization Name: University of Glasgow Division:

* Street1: Glasgow G12 8QQ

Street2:

* City: Glasgow County/ Parish:

* State: Province:

* Country: GBR: UNITED KINGDOM * Zip / Postal Code:

* Phone Number: +44 (0) 784 1248374 Fax Number:

* E-Mail: brian.willett@glasgow.ac.uk

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Research Scientist, Immunologist

Degree Type: PhD

Degree Year: 1989

Attach Biographical Sketch	1255 Willett_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1256 Willett_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 8

Prefix: Dr. * First Name: Venance Middle Name: Phillip

* Last Name: Maro Suffix:

Position/Title: Dean, Faculty of Medicine Department:

Organization Name: Kilimanjaro Christian Medical University College Division:

* Street1: P.O. Box 3010/2240

Street2:

* City: Moshi County/ Parish:

* State: Province:

* Country: TZA: TANZANIA, UNITED REPUBLIC OF * Zip / Postal Code:

* Phone Number: +255 272753616 Fax Number:

* E-Mail: venmaro@ymail.com

Credential, e.g., agency login:

* Project Role: Other (Specify) Other Project Role Category: Research Scientist

Degree Type: MMed

Degree Year: 2002

Attach Biographical Sketch	1257-Maro_CV.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1258-Maro_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 9

Prefix: Dr. * First Name: Gustine Middle Name: Alphonce

* Last Name: Assenga Suffix:

Position/Title: Animal Health Focal Person Department:

Organization Name: OECD, Ministry of Livestock and Fisheries Division:

* Street1: PO Box 2870

Street2:

* City: Dodoma County/ Parish:

* State: Province:

* Country: TZA: TANZANIA, UNITED REPUBLIC OF * Zip / Postal Code:

* Phone Number: 2123804460 Fax Number:

* E-Mail: assengakanda@yahoo.com

Credential, e.g., agency login:

* Project Role: Other (Specify) Other Project Role Category: Research Scientist, Veterinarian

Degree Type: PhD

Degree Year: 2016

Attach Biographical Sketch	1259 Assenga_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1260 Assenga_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 10

Prefix: | * First Name: Jubilate | Middle Name:

* Last Name: Bernard Minja | Suffix:

Position/Title: Focal Person for Human Health | Department:

Organization Name: OMCD, Ministry of Livestock and Fisheries | Division:

* Street1: PO Box 2870

Street2:

* City: Dodoma | County/ Parish:

* State: | Province:

* Country: TZA: TANZANIA, UNITED REPUBLIC OF | * Zip / Postal Code:

* Phone Number: 2123804460 | Fax Number:

* E-Mail: jubbybm@yahoo.com

Credential, e.g., agency login:

*** Project Role:** Other (Specify) | **Other Project Role Category:** Research Scientist, Public Health

Degree Type: MPH

Degree Year: 2008

Attach Biographical Sketch	1261-Bernard Minja_Biosketch		Delete Attachment	View Attachment
Attach Current & Pending Support	1262-Bernard Minja_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 11

Prefix: Dr. | * First Name: Roger | Middle Name:

* Last Name: Hewson | Suffix:

Position/Title: Scientific Leader Viral Hemorrhagic Fevers | Department:

Organization Name: Public Health England | Division:

* Street1: SP4 0JG

Street2:

* City: Salisbury | County/ Parish:

* State: | Province:

* Country: GBR: UNITED KINGDOM | * Zip / Postal Code:

* Phone Number: +44 (0)1980 612 390 | Fax Number:

* E-Mail: roger.hewson@phe.gov.uk

Credential, e.g., agency login:

*** Project Role:** Other (Specify) | **Other Project Role Category:** Research Scientist, Virologist

Degree Type: DPhil

Degree Year: 1992

Attach Biographical Sketch	1263 Hewson_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1264 Hewson C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 12

Prefix:		* First Name:	Julius	Middle Name:	Delle
* Last Name:	Keyyu			Suffix:	
Position/Title:	Director of Research Development and Coord.			Department:	
Organization Name:	Tanzania Wildlife Research Institute			Division:	
* Street1:	PO Box 661				
Street2:					
* City:	Arusha			County/ Parish:	
* State:				Province:	
* Country:	TZA: TANZANIA, UNITED REPUBLIC OF			* Zip / Postal Code:	
* Phone Number:	+255 27 254 9571			Fax Number:	
* E-Mail:	julius.keyyu@tawiri.or.tz				

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Research Scientist, Disease Ecologist

Degree Type: PhD

Degree Year: 2004

Attach Biographical Sketch	1265-Keyyu_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1266-Keyyu_C&P.pdf		Delete Attachment	View Attachment

Melinda Rostal
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: rostal@ecohealthalliance.org

Professional Preparation

Princeton University	Ecol. and Evol. Bio.	AB	2003
University of Minnesota	Public Health	MPH	2007
University of Minnesota	Veterinary Medicine	DVM	2008
University of Glasgow	Epidemiology	PhD	Expected 2019

Appointments

Senior Research Scientist, EcoHealth Alliance	2012 - present
Rift Valley Fever Project Manager, EcoHealth Alliance	2014 - present
PREDICT 2 EHA Surveillance Coordinator, EcoHealth Alliance	2014 - present
PREDICT Latin American Regional Coordinator, EcoHealth Alliance	2010 - 2014
Adjunct Research Scientist, Columbia University	2010 - present
Associate Veterinarian, Tahoma Veterinary Hospital	2008 - 2010

Selected Publications

Msimang V, Thompson PN, van Vuren JP, Rostal MK, Weyer J, Moolla N, Cordel C, Tempia S, *Karesh WB*, Paweska JP. (2017) Projected numbers of historical human Rift Valley fever and Crimean-Congo haemorrhagic fever cases in South Africa. **South African Society for Veterinary Epidemiology and Preventive Medicine Congress Proceedings** p322.

Rostal MK, Ross N, Machalaba C, Cordel C, Paweska JT, *Karesh WB*. (2018) Benefits of a one health approach: An example using Rift Valley fever. **One Health** 5:34-36.

Brand R, Rostal MK, Kemp A, Anyamba A, Zweigers H, van Huuysteen C, *Karesh WB*, Paweska JP. (2018) A phytosociological analysis and description of wetland vegetation and ecological factors associated with locations of high mortality for the 2010-11 Rift Valley fever outbreak in South Africa. **PLoS One** 13(2):e0191585.

Islam A, Epstein JH, Rostal MK, Islam S, Rahman MZ, Hossain ME, Uzzaman MJ, Munster V, Peiris M, Flora MS, Rahman M, Daszak P. (2018) Middle East respiratory syndrome coronavirus antibodies in dromedary camels (*Camelus dromedarius*) Bangladesh, 2015. **Emerging Infectious Diseases** 24(5):926-928.

Rostal MK, Liang JE, Zimmermann D, Bengis R, Paweska JP, *Karesh WB*. (2017) Rift Valley Fever: Does Wildlife Play a Role? **International Journal of Laboratory Animals** 1-12.

Anthony SJ, Islam A, Johnson C, Navarrete-Macias I, Liang E, Jain K, Hitchens PL, Che X, Soloyvov A, Hicks AL, Ojeda-Flores R, *Zambrana-Torrelio C*, Ulrich W, Rostal MK, Petrosov A, Garcia J, Haider N, Wolfe N, Goldstein T, Morse SS, Rahman M, Epstein JH, Mazet JK, Daszak P & Lipkin WI. (2015) Non-random patterns in viral diversity. **Nature Communications** 6:8147.

Rostal MK, Evans A, Akoolo L, Wakhule L, Macharia J, Breiman R, and Njenga K. (2010) Rift Valley fever virus activity during inter-epidemic periods: Identification of potential vectors and detection of antibodies in livestock. **American Journal of Veterinary Research** 71(5):522-526.

Evans A, Gakuya F, Paweska JT, Rostal MK, Akoolo L, Van Vuren P, Manyibe T, Macharia J, Ksiazek T, Feikin D, Breiman R, Njenga K. (2008) Prevalence of antibodies against Rift Valley fever virus in Kenya wildlife during an inter-epidemic period. **Epidemiology & Infection** 136(9):1261-9.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Melinda Rostal	Other agencies (including NSF) to which this proposal has been submitted: N/A

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Project. Cal: 5.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,988,526.00 Total Award Period Covered: 6/1/19-5/31/24
Location of Project: EcoHealth Alliance, South Africa
Person-Months Per Year Committed to the Project: Cal: 6.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding Rift Valley Fever in Republic of South Africa

Source of Support: DTRA
Total Award Amount: $4,936,359.00 Total Award Period Covered: 5/28/14-5/27/19
Location of Project: EcoHealth Alliance, South Africa
Person-Months Per Year Committed to the Project. Cal: 7.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Rift Valley Fever Virus in a Hyperendemic Region

Source of Support: NIH
Total Award Amount: $338,570.00 Total Award Period Covered: 12/1/2019-11/30/21
Location of Project: EcoHealth Alliance, South Africa
Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Viral interactions within hosts influence transmission dynamics between hosts

Source of Support: NSF
Total Award Amount: $2,510,757.40 Total Award Period Covered: 7/1/2019-6/30/2024
Location of Project: EcoHealth Alliance, Bangladesh
Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Roger Hewson
Virology & Pathogenesis Group, National Infection Service, Public Health England (PHE), UK
E-mail: roger.hewson@phe.gov.uk

Professional Preparation

University of Exeter	Biochemistry	BSc	1987
University of Oxford	Biochemistry	DPhil	1992

Appointments

Head of WHO Collaborating Centre for Virus Research & Reference, PHE	2010 - present
Scientific Leader - Viral Hemorrhagic Fevers & Arboviruses, PHE	2007 - present
Virology & Pathogenesis Group Leader, PHE Porton Down	2004 - present
Molecular Virologist, Centre for Emergency Preparedness & Response	2000 - 2004
Fellow, Dept Molecular Pathology, University of Wisconsin, Madison, USA	1999 - 2000
Virologist, Centre for Applied Microbiology, Porton Down	1998 - 1999
Fellow, Karolinska Institute, Dept. Molecular Virology, Sweden	1993 - 1998
Research Assistant, Queen Mary, University of London	1992 - 1993
Research Assistant, Dept. Biochemistry, University Oxford	1988 - 1992

Selected Publications

Bonney LC, Watson RJ, Afrough B, Mullojonova M, Dzhuraeva V, Tishkova F, Hewson R. (2017) A recombinase polymerase amplification assay for rapid detection of Crimean-Congo hemorrhagic fever virus infection. **PLoS Neglected Tropical Diseases** 11(10):e0006013.

Muianga AF, Watson R, Varghese A, Chongo IS, Ali S, Monteiro V, Inalda F, Chelene I, António V, Hewson R, Gudo ES. (2017) First serological evidence of Crimean-Congo hemorrhagic fever in febrile patients in Mozambique. **International Journal of Infectious Diseases** 62:119-123.

Nurmakhanov T, Sansyzbaev Y, Atshabar B, Deryabin P, Kazakov S, Zholshorinov A, Matzhanova A, Sadvakassova, Atkinson B, Hewson R. (2015) Crimean-Congo haemorrhagic fever virus in Kazakhstan (1948-2013). **International Journal of Infectious Diseases** 38:19-23.

Chamberlain J, Cook N, Lloyd G, Mioulet V, Tolley H, Hewson R. (2005) Co-evolutionary patterns of variation in small and large RNA segments of Crimean-Congo hemorrhagic fever virus. **Journal of General Virology** 86(12):3337-3341.

Hewson R, Gmyl A, Gmyl L, Smirnova SE, Karganova G, Jamil B, Hasan R, Chamberlain J, Clegg C. (2004) Evidence of segment reassortment in Crimean-Congo hemorrhagic fever virus. **Journal of General Virology** 85(10):3059-3070.

Hewson R, Chamberlain J, Lloyd G, Jamil B, Gmyl A, Smirnova SE, Lukashev A, Karganova G, Clegg C. (2004) Crimean-Congo haemorrhagic fever virus: Sequence analysis of the small RNA segments from a collection of viruses world-wide. **Virus Research** 102(2):185-189.

Atkinson B, Hewson R. (2018) Emerging arboviruses of clinical importance in Central Asia. **Journal of General Virology** 99(9):1172-1184.

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Hewson R. (2017) Lessons learnt from imported cases and onward transmission of Lassa fever in Europe support broader management of viral hemorrhagic fevers. **Eurosurveillance** 22(39).

Furaha Mramba
Tanzania Veterinary Laboratory Agency, P.O. Box 9254, Dar es Salaam, Tanzania
E-mail: furaha58@yahoo.com

Professional Preparation

University of Dar es Salaam	Zoology and Botany	BSc	1983
University of Florida	Medical Entomology	MSc	2002
Kansas State University	Medical Entomology	PhD	2006

Appointments

Chief Executive, Tanzania Veterinary Laboratory Agency	2016 - present
Acting Chief Executive, Tanzania Veterinary Laboratory Agency	2013 - 2016
Director, Tsetse and Trypanosomiasis Research Institute (TTRI)	2010 - 2013
Principal Livestock Research Officer, TTRI	2006 - 2010
Senior Livestock Research Officer, TTRI	2000 - 2006
Scientific Officer 1, Tanzania Livestock Research Organisation	1983 - 2000

Publications

Lord J, Torr S, Auty H, Brock P, Byamungu M, Hargrove J, Morrison L, Mramba F, Vale G, Stanton M. (2018) Geostatistical models using remotely-sensed data predict savanna tsetse decline across the interface between protected and unprotected areas in Serengeti, Tanzania. **Journal of Applied Ecology** 55(4):1997-2007.

Luziga C, Muya C, Mramba F, Byamungu M, Mbata G, Mtambuki A. (2017) A tsetse *Glossina pallidipes* harbors the pathogenic trypanosomes circulating in Liwale district, Tanzania. **Veterinary Parasitology: Regional Studies and Reports** 9:93-97.

Manangwa O, Ouma JO, Malele I, Mramba F, Msangi A, Nkwengulila G. (2016) Trypanosome prevalence in *Glossina fuscipes fuscipes* (tsetse) and cattle along the shores of Lake Victoria in Tanzania. **Livestock Research for Rural Development** 28(8).

Manangwa O, Ouma JO, Malele I, Msangi A, Mramba F, Nkwengulila G. (2015) Distribution and population size of *Glossina fuscipes fuscipes* (tsetse flies) along the Lake Victoria, for trypanosomiasis management in Tanzania. **Livestock Research for Rural Development** 27(2):121-125.

International Glossina Genome Initiative. (2014) Genome sequence of the tsetse fly (*Glossina morsitans*): Vector of African trypanosomiasis. **Science** 344(6182):380-386.

Vreysen M, Saleh K, Mramba F, Parker A, Feldmann U, Dyck V, Msangi A, Bouyer J. (2014) Sterile insects to enhance agricultural development: The case of sustainable tsetse eradication on Unguja Island, Zanzibar, using an area-wide integrated pest management approach. **PLoS Neglected Tropical Diseases** 8(5):e2857.

Mramba F, Oloo F, Byamungu M, Krober T, McMullin A, Mihok S, Guerin P. (2013) Standardizing visual control devices for tsetse flies: East African species *Glossina swynnertoni* **PLoS Neglected Tropical Diseases** 7(2):e2063.

Mramba F, Broce A, Zurek L. (2007) Vector competence of stable flies, *Stomoxys calcitrans* (Diptera: Muscidae) for *Enterobacter sakazakii*. **Journal of Vector Ecology** 32:135-139.

Julius Dotto Keyyu
Tanzania Wildlife Research Institute, Box 661, Arusha
E-mail: julius.keyyu@tawiri.or.tz

Professional Preparation

Sokoine University of Agriculture	Veterinary Medicine	BVM	1995
Sokoine University of Agriculture	Veterinary Medicine	MVM	1998
Sokoine University of Agriculture	Disease Ecology	PhD	2004

Appointments

Director of Research Development and Coordination, Tanzania Wildlife Research Institute (TAWIRI)	2006 - present
Acting Head, Research Development Section, TAWIRI	2005 - 2006
Assistant to Director of Research Development and Coordination, TAWIRI	2004 - 2006
Senior Research Scientist I, TAWIRI	2003 - 2005
Research Scientist, Livestock Helminths Research Project, Sokoine University of Agriculture	1998 - 1999
Veterinary Clinician, Mwenge Veterinary Clinic	1995 - 1995

Selected Publications

Allan KJ, Halliday JE, Moseley M, Carter RW, Ahmed A, Goris MG, Hartskeerl RA, Keyyu J, Kibona T, *Maro VP*, Maze MJ. (2018) Assessment of animal hosts of pathogenic *Leptospira* in northern Tanzania. **PLoS Neglected Tropical Diseases** (12)6:e0006444.

Logan N, Dundon WG, Diallo A, Baron MD, Nyarobi MJ, *Cleaveland S*, Keyyu J, Fyumagwa R, Hosie MJ, *Willett BJ*. (2016) Enhanced immunosurveillance for animal morbilliviruses using vesicular stomatitis virus (VSV) pseudotypes. **Vaccine** 34(47):5736-5743.

Lankester F, Russell GC, Lugelo A, Ndabigaye A, Mnyambwa N, Keyyu J, Kazwala R, Grant D, Percival A, Deane D, Haig DM (2016) A field vaccine trial in Tanzania demonstrates partial protection against malignant catarrhal fever in cattle. **Vaccine** 34(6):831-838.

Lankester F, Lugelo A, Werling D, Mnyambwa N, Keyyu J, Kazwala R, Grant D, Smith S, Parameswaran N, *Cleaveland S*, Russell G. (2016) The efficacy of alcelaphine herpesvirus-1 (AlHV-1) immunization with the adjuvants Emulsigen® and the monomeric TLR5 ligand FliC in zebu cattle against AlHV-1 malignant catarrhal fever induced by experimental virus challenge. **Veterinary Microbiology** 195:144-153.

Lankester F, Lugelo A, Mnyambwa N, Ndabigaye A, Keyyu J, Kazwala R, Grant DM, Relf V, Haig DM, *Cleaveland S*, Russell GC. (2015). Alcelaphine herpesvirus-1 (malignant catarrhal fever virus) in wildebeest placenta: Genetic variation of ORF50 and A9.5 alleles. **PLoS One** 10(5)e0124121.

Kamani TM, Kazwala R, Mfinanga S, Haydon D, Keyyu J, *Lankester F*, Buza J. (2015) One Health: A concept led by Africa, with global benefits. **The Veterinary Record.** 176(19):496.

Lankester F, Lugelo A, Kazwala R, Keyyu J, *Cleaveland S*, Yoder J. (2015) The economic impact of malignant catarrhal fever on pastoralist livelihoods. **PLoS One** 10(1):e0116059.

Keyyu JD, Kassuku AA, Willingham AL, Kyvsgaard NC. (2001) Peri-parturient helminthosis in strains of small East African goats in Tanzania. **Preventive Veterinary Medicine** 50(1-2):177-182.

Keyyu JD, Kassuku AA, Kyvsgaard NC, Willingham AL. (1998) Development of resistance to gastrointestinal nematodes in small East African goats. **Parasitology International** (47):144.

Blandina Theophil Mmbaga
Kilimanjaro Clinical Research Institute, 2236 Moshi, Tanzania
E-mail: b.mmbaga@kcri.ac.tz

Professional Preparation

Nizhny Novgorod State Medical Academy	Medicine	MD	2001
Tumaini University	Pediatrics	MMED	2007
University of Bergen	Public Health and Epidemiology	PhD	2013

Appointments

Director of Research and Consultancies, Kilimanjaro Christian Medical University College (KCMUCo)	2018 - present
Research Director, Kilimanjaro Clinical Research Institute	2015 - present
Senior Lecturer, KCMUCo	2015 - present
Adjunct Assistant Professor, Duke Global Health Institute	2014 - present
Principal Investigator, Kilimanjaro Christian Medical Centre (KCMC) WESTAT/NICHD IMPAACT CRS	2014 - present
Site leader, Duke-KCMC Clinical research	2013 - present
Lecturer, KCMUCo	2013 - 2015
Pediatrician, Kilimanjaro Christian Medical Centre	2007 – present

Selected Publications

Allan KJ, Halliday JEB, Moseley M, Carter RW, Ahmed A, Goris MGA, Hartskeerl RA, *Keyyu J*, Kibona T, *Maro VP*, Maze MJ, Mmbaga BT, Tarimo R, Crump JA, *Cleaveland S*. (2018) Assessment of animal hosts of pathogenic *Leptospira* in northern Tanzania. **PLoS Neglected Tropical Diseases** 12(6):e0006444.

Maze MJ, Cash-Goldwasser S, Rubach MP, Biggs HM, Galloway RL, Sharples KJ, Allan KJ, Halliday JE, *Cleaveland S*, Shand MC, Muiruri C, Kazwala RR, Saganda W, Lwezaula BF, Mmbaga BT, *Maro VP*, Crump JA. (2018) Risk factors for human acute leptospirosis in northern Tanzania. **PLoS Neglected Tropical Diseases** 12(6):e0006372.

Snavely ME, Maze MJ, Muiruri C, Ngowi L, Mboya F, Beamesderfer J, Makupa G, Mwingwa AG, Lwezaula BF, Mmbaga BT, *Maro VP*, Crump JA, Ostermann J, Rubach MP. (2018) Sociocultural and health system factors associated with mortality among febrile inpatients in Tanzania: A prospective social biopsy cohort study. **BMJ Global Health** 3(1):e000507.

van Zwetselaar M, Nyombi B, Sonda T, Kumburu H, Chamba N, Dekker MCJ, Kilonzo KG, Urasa SJ, Mmbaga BT (2018) *Aeromonas caviae* mimicking *Vibrio cholerae* infectious enteropathy in a cholera-endemic region with possible public health consequences: Two case reports. **Journal of Medical Case Reports** 12(1):71.

Cash-Goldwasser S, Maze MJ, Rubach MP, Biggs HM, Stoddard RA, Sharples KJ, Halliday JEB, *Cleaveland S*, Shand MC, Mmbaga BT, Muiruri C, Saganda W, Lwezaula BF, Kazwala RR, *Maro VP*, Crump JA. (2018) Risk factors for human brucellosis in northern Tanzania. **American Journal of Tropical Medicine and Hygiene** 98(2):598-606.

William B. Karesh
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: karesh@ecohealthalliance.org

Professional Preparation

Clemson University	Biology	BS	1977
Univ. of Georgia	Veterinary Medicine	DVM	1982
Zool. Society of San Diego	Residency – Wildlife Health		1982-1984

Appointments

Emerging Pandemic Threats Partner Liaison, USAID EPT PREDICT-2	2014-present
Advisor, WHO Expert Panel on MERS-CoV	2013-present
Expert, WHO International Health Regulation Roster of Experts	2013-present
Executive Vice President for Health & Policy, EcoHealth Alliance	2010-present
Chief Technical Officer, USAID EPT PREDICT	2009-2014
President, Working Group on Wildlife Diseases, OIE, France	2008-present
Chief of Party, USAID Global Avian Influenza Network for Surveillance	2006-2009
Co-Chair, Wildlife Health Specialist Group, IUCN, Switzerland	2001-present
Vice President & Director, Global Health Programs, Wildlife Cons. Society	2001-2010

Publications

Brand RF, *Rostal MK*, Kemp A, Anyamba A, Zwiegers H, Van Huyssteen CW, Karesh WB, Paweska JT. (2018) A phytosociological analysis and description of wetland vegetation and ecological factors associated with locations of high mortality for the 2010-11 Rift Valley fever outbreak in South Africa. **PLoS One**. 13(2):e0191585.

Rostal MK, Liang JE, Zimmerman D, Bengis R, Paweska J, Karesh WB. (2017) Rift Valley fever: Does wildlife play a role? **The International Journal of Laboratory Animals** 58(3):359-370.

Morse SS, Mazet JAK, Woolhouse M, Parrish CR, Carroll D, Karesh WB, *Zambrana-Torrelio C*, Lipkin WI, Daszak P. (2012) Prediction and prevention of the next pandemic zoonosis. **The Lancet** 380:1956-1965.

Karesh WB, Dobson A, Lloyd-Smith J, Lubroth J, Dixon MA, Bennett M, Aldrich S, Harrington T, Formenty P, Loh L, Machalaba CC, Thomas MJ, Heymann DL. (2012) The ecology of zoonoses: Their natural and unnatural histories. **The Lancet** 380:1936-1945.

Karesh WB. (2008) Wildlife health as an indicator of climate change. Institute of Medicine, Global Climate Change and Extreme Weather Events: Understanding the Contributions to Infectious Disease Emergence: Workshop Summary. Washington, DC: **The National Academies Press** 2008:192-213.

Nyamsuren D, Joly DO, Enkhtuvshin S, Odonkhuu D, Olson KA, Draisma M, Karesh WB. (2006) Exposure of Mongolian gazelles (*Procapra gutturosa*) to foot and mouth disease virus. **Journal of Wildlife Diseases** 42(1):154-158.

Karesh WB and Cook RA. (2005) The human-animal link, One World-One Health. **Foreign Affairs** 84:38-50.

Leroy EM, Rouquet P, Formenty P, Souquiere S, Kilbourn A, Froment JM, Bermejo M, Smit S, Karesh WB, Swanepoel R, Zaki SR, Rollin PE. (2004) Multiple Ebola virus transmission events and rapid decline of central African wildlife. **Science** 303:387-390.

Wolfe ND, Karesh WB, Kilbourn AM, Cox-Singh J, Bosi EJ, Rahman HA, Singh B, Andau M, Spielman A. (2002) The impact of ecological change on the prevalence of malaria among orangutans. **Vector Borne and Zoonotic Diseases** 2(2):97-103.

Wolfe ND, Kilbourn AM, Rahman HA, Bosi EJ, Cropp BC, Andau M, Karesh WB, Spielman, A, Gubler, DJ. (2001) Sylvatic transmission of arboviruses among Bornean orangutans. **American Journal of Tropical Medicine and Hygiene** 64:310-316.

Sarah Cleaveland
College of Medical, Veterinary and Life Sciences, University of Glasgow, G12 8QQ, UK
E-mail: sarah.cleaveland@glasgow.ac.uk

Professional Preparation

Southampton University	Zoology	BSc	1983
University of Cambridge	Veterinary Medicine	VetMB	1988
University of London	Epidemiology	PhD	1996

Appointments

Professor, Comparative Epidemiology, University of Glasgow	2008 - present
Lecturer, Tropical Veterinary Medicine, University of Edinburgh	1998 - 2008
Research Fellow, London School of Hygiene and Tropical Medicine	1996 - 1998
Veterinary Research Fellow, Institute of Zoology/LSHTM	1992 - 1996
Research Assistant, Institute of Zoology	1989 - 1992
Assistant Veterinary Surgeon, Southill Veterinary Group	1988 – 1989

Selected Publications

Casey-Bryars M, Reeve R, Bastola U, Knowles NJ, Auty H, Bachanek-Bankowska K, Fowler VL, Fyumagwa R, Kazwala R, Kibona T, King A, King DP, *Lankester F*, Ludi AB, Lugelo A, Maree FF, Mshanga D, Ndhlovu G, Parekh K, Paton DJ, Perry B, Wadsworth J, Parida S, Haydon DT, Marsh TL, Cleaveland S, Lembo T. (2018) Waves of endemic foot-and-mouth disease in eastern Africa suggest feasibility of proactive vaccination approaches. **Nature Ecology & Evolution** 2:1449-1457.

Cleaveland S, Sharp J, Abela-Ridder B, Allan KJ, Buza J, Crump JA, Davis A, Del Rio Vilas VJ, de Glanville WA, Kazwala RR, Kibona T. (2017) One Health contributions towards more effective and equitable approaches to health in low- and middle-income countries. **Philosophical Transactions of the Royal Society of London B: Biological Sciences** 372(1725):20160168.

Halliday JEB, Hampson K, Hanley N, Lembo T, Sharp JP, Haydon DT, Cleaveland S. (2017) Driving improvements in emerging disease surveillance through locally-relevant capacity strengthening. **Science** 357:146-148.

Mtema Z, Changalucha J, Cleaveland S, Elias M, Ferguson HM, Halliday JE, Haydon DT, Jaswant G, Kazwala R, Killeen GF, Lembo T. (2016) Mobile phones as surveillance tools: Implementing and evaluating a large-scale intersectoral surveillance system for rabies in Tanzania. **PLoS Medicine** 13(4):e1002002.

Logan N, Dundon WG, Diallo A, Baron MD, Nyarobi MJ, Cleaveland S, *Keyyu J*, Fyumagwa R, Hosie MJ, *Willett BJ*. (2016) Enhanced immunosurveillance for animal morbilliviruses using vesicular stomatitis virus pseudotypes. **Vaccine**. 34(47):5736-5743.

Viana M, Cleaveland S, Matthiopoulos J, Halliday J, Packer C, Craft ME, Hampson K, Czupryna A, Dobson AP, Dubovi EJ, Ernest E. (2015) Dynamics of a morbillivirus at the domestic-wildlife interface: Canine distemper virus in domestic dogs and lions. **Proceedings of the National Academy of Sciences** 112(5):1464-1469.

Lankester F, Hampson K, Lembo T, Palmer G, Taylor L, Cleaveland S. (2014) Implementing Pasteur's vision for rabies elimination: The evidence base and the needed policy actions. **Science** 345:1562-1564.

Brian James Willett
University of Glasgow Centre for Virus Research Garscube Estate, Glasgow G61 1QH, UK
E-mail: brian.willett@glasgow.ac.uk

Professional Preparation

University of Strathclyde	Biochemistry/Pharmacology	BSc	1986
University of Strathclyde	Immunology	PhD	1989

Appointments

Professor of Viral Immunology, University of Glasgow	2008 - present
Head of Division, Veterinary Infection & Immunity, University of Glasgow	2003 - 2010
Senior Lecturer in Veterinary Immunology, University of Glasgow	1999 - 2003
Career Development Fellow, University of Glasgow	1995 - 1999
Post-doc. Research Assistant, University of Glasgow	1989 - 1995

Selected Publications

Abdullah N, Kelly JT, Graham SC, Birch J, Gonçalves-Carneiro D, Mitchell T, Thompson RN, Lythgoe KA, Logan N, Hosie MJ, Bavro VN, Willet BJ, Heaton MP, Bailey D. (2018) Structure-guided identification of a nonhuman morbillivirus with zoonotic potential. **Journal of Virology** 92(23):e01248-18.

Baron MD, Diop B, Njeumi F, Willett BJ, Bailey D. (2017) Future research to underpin successful peste des petits ruminants virus (PPRV) eradication. **Journal of General Virology** 98(11):2635-2644.

Logan N, Dundon WG, Diallo A, Baron MD, James Nyarobi M, *Cleaveland S, Keyyu J,* Fyumagwa R, Hosie MJ, Willett BJ. (2016) Enhanced immunosurveillance for animal morbilliviruses using vesicular stomatitis virus pseudotypes. **Vaccine** 34(47):5736-5743.

Holzer B, Hodgson S, Logan N, Willett BJ, Baron MD. (2016) Protection of cattle against rinderpest by vaccination with wild-type but not attenuated strains of peste des petits ruminants virus. **Journal of Virology** 90(10):5152-5162.

Logan N, McMonagle E, Drew AA, Takahashi E, McDonald M, Baron MD, Gilbert M, *Cleaveland S,* Haydon DT, Hosie MJ, Willett BJ. (2016) Efficient generation of vesicular stomatitis virus-pseudotypes bearing morbilliviral glycoproteins and their use in quantifying virus neutralising antibodies. **Vaccine** 34(6):814-822.

Viana M, *Cleaveland S,* Matthiopoulos J, Halliday J, Packer C, Craft ME, Hampson K, Czupryna A, Dobson AP, Dubovi EJ, Ernest E, Fyumagwa R, Hoare R, Hopcraft JG, Horton DL, Kaare MT, Kanellos T, *Lankester F,* Mentzel C, Mlengeya T, Mzimbiri I, Takahashi E, Willett B, Haydon DT, Lembo T. (2015) Dynamics of a morbillivirus at the domestic-wildlife interface: Canine distemper virus in domestic dogs and lions. **Proceedings of the National Academy of Sciences** 112(5):1464-1469.

Venance Phillip Maro
Kilimanjaro Christian Medical University College (KCMUCo) Kilimanjaro Moshi P.O. Box 3010/2240 Moshi Tanzania
E-mail: venmaro@ymail.com

Professional Preparation

University of Dar-es Salaam-Muhimbili	Medicine	MD	1992
Humboldt University	Public Health and Tropical Medicine	Diploma	2001
Tumaini University Iringa	Medicine	MMed	2002
Duke University	Clinical Research	Certificate	2005

Appointments

Dean, Faulty of Medicine, KCMUCo	2015 - present
Associate Professor, Internal Medicine, KCMUCo	2015 - present
Chief and Consultant, KCMUCo	2004 - 2015

Publications

Ramadhani HO, Muruiri C, Maro VP, Omondi M, Mushi JB, Lirhunde ES, Bartlett JA. (2017) Patient-initiated repackaging of antiretroviral therapy, viral suppression and drug resistance. **AIDS and Behavior** 22(5):1671-1678.

Cash-Goldwasser S, Maze MJ, Rubach MP, Biggs HM, Stoddard RA, Sharples KJ, Halliday JE, *Cleaveland S*, Shand MC, *Mmbaga BT*, Muiruri C, Saganda W, Lwezaula BF, Kazwala RR, Maro VP, Crump JA. (2018) Risk factors for human brucellosis in northern Tanzania. **The American Journal of Tropical Medicine and Hygiene** 98(2):598-606.

Stanifer JW, Karia F, Maro V, Kilonzo K, Qin X, Patel UD, Hauser ER. (2017) APOL1 risk alleles among individuals with CKD in northern Tanzania: A pilot study. **PloS One** 12(7):e0181811.

Ladbury G, Allan KJ, *Cleaveland S*, Davis A, de Glanville WA, Forde TL, Halliday JE, Haydon DT, Kibiki G, Kiwelu I, Lembo T, Maro VP, *Mmbaga BT*, Ndyetabura T, Sharp J, Thomas K, Zadoks RN. (2017) One Health research in northern Tanzania–challenges and progress. **East African Health Research Journal** 1(1):8-18.

Carugati M, Biggs HM, Maze MJ, Stoddard RA, Cash-Goldwasser S, Hertz JT, Halliday JE, Saganda W, Lwezaula BF, Kazwala RR, *Cleaveland S*, Maro VP, Rubach MP, Crump JA. (2018) Incidence of human brucellosis in the Kilimanjaro Region of Tanzania in the periods 2007–2008 and 2012–2014. **Transactions of The Royal Society of Tropical Medicine and Hygiene** 112(3):136-43.

Allan KJ, Halliday JE, Moseley M, Carter RW, Ahmed A, Goris MG, Hartskeerl RA, *Keyyu J*, Kibona T, Maro VP, Maze MJ. (2018) Assessment of animal hosts of pathogenic *Leptospira* in northern Tanzania. **PLoS Neglected Tropical Diseases** 12(6):e0006444.

Maze MJ, Cash-Goldwasser S, Rubach MP, Biggs HM, Galloway RL, Sharples KJ, Allan KJ, Halliday JE, Cleaveland S, Shand MC, Muiruri C, Kazwala RR, Saganda W, Lwezaula BF, *Mmbaga BT*, Maro VP, Crump JA. (2018) Risk factors for human acute leptospirosis in northern Tanzania. **PLoS Neglected Tropical Diseases** 12(6):e0006372.

Felix Lankester
School for Global Animal Health, Washington State University, Pullman, WA, 99164, USA
Email: felix.lankester@wsu.edu

Professional Preparation

University of Liverpool	Veterinary Science	BVSc	1995
Royal Veterinary College	Wild Animal Health	MSc	2003
University of Glasgow	Veterinary Epidemiology	PhD	2016

Appointments

Vice President, Global Animal Health Tanzania	2018 - present
Assistant Professor, Washington State University	2012 - present
Director, Serengeti Health Initiative	2012 - present
Country Director, Global Animal Health Tanzania	2014 - 2018
Director of Tanzanian Programs, Lincoln Park Zoo	2009 - 2012
Cameroon Country Director, Pandrillus Foundation	2006 - 2009
Director and Head Veterinarian of Limbe Wildlife Centre, Pandrillus Foundation	2004 – 2009
Consultant, Mediae Production Company	2003 - 2004
Volunteer Veterinary Officer, The Orang-utan Foundation	2002 - 2003
Assistant Producer, Granada Wild/Partridge Films	1997 - 2001
Veterinary Officer, Various Veterinary Institutions	1995 - 2001

Selected Publications

Casey-Bryars M, … Lankester F, …*Cleaveland S*, Lembo T. (2018) Waves of endemic foot-and-mouth disease in eastern Africa suggest feasibility of proactive vaccination approaches. **Nature Ecology & Evolution** 2(9):1449.

Köndgen S, Calvignac-Spencer S, Grützmacher K, Keil V, Mätz-Rensing K, Nowak K, Metzger S, Kiyang J, Becker AL, Deschner T, Wittig RM, Lankester F, Leendertz FH. (2017) Evidence for human *Streptococcus pneumoniae* in wild and captive chimpanzees: A potential threat to wild populations. **Scientific Reports** 7(1):14581.

Cleaveland S, Sharp J, Abela-Ridder B, Allan KJ, Buza J, Crump JA, Davis A, Del Rio Vilas VJ, de Glanville WA, Kazwala RR, Kibona T, Lankester FJ, Lugelo A, *Mmbaga BT*, Rubach MP, Swai ES, Waldman L, Haydon DT, Hampson K, Halliday JEB. (2017) One Health contributions towards more effective and equitable approaches to health in low- and middle-income countries. **Philosophical Transactions of the Royal Society B: Biological Sciences** 372(1725):20160168.

Lankester F, Davis A. (2016) Pastoralism and wildlife: Historical and current perspectives in the East African rangelands of Kenya and Tanzania. **Revue Scientifique et Technique (International Office of Epizootics)** 35(2):473-484.

Czupryna AM, Brown JS, Bigambo MA, Whelan CJ, Mehta SD, Santymire RM, Lankester F, Fasut L. (2016) Ecology and demography of free-roaming domestic dogs in rural villages near Serengeti National Park in Tanzania. **PLoS One** 11(11):e0167092.

Lankester FJ, Wouters PA, Czupryna A, Palmer GH, Mzimbiri I, *Cleaveland S*, Francis MJ, Sutton DJ, Sonnemans DG. (2016) Thermotolerance of an inactivated rabies vaccine for dogs. **Vaccine** 34(46):5504–5511.

Lankester F, Russell GC, Lugelo A, Ndabigaye A, Mnyambwa N, *Keyyu J*, Kazwala R, Grant D, Percival A, Deane D, Haig DM. (2016) A field vaccine trial in Tanzania demonstrates partial protection against malignant catarrhal fever in cattle. **Vaccine** 34(6):831-838.

Carlos Zambrana-Torrelio
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: zambrana@ecohealthalliance.org

Professional Preparation

University Mayor de San Andres	Biology	BSc	2004
University of Puerto Rico	Ecology, Evolution and Systematics	MSc	2009
Sapienza University of Rome	Environmental and Evolutionary Biology	PhD	2017

Appointments

Associate Vice President for Conservation and Health	2017 - present
Senior Research Scientist, EcoHealth Alliance	2014 - 2017
Research Scientist, EcoHealth Alliance	2010 - 2013
Research Associate, Institute of Molecular Biology and Biotechnology, Bolivia	2008 - present
Consultant, NatureServe	2006 - 2006
Researcher, Wildlife Conservation Society	2002 - 2003
Research Associate, Centro de Analisis Espacial – Bolivia	1999 - 2002

Selected Publications

Olival KJ, Hosseini PR, Zambrana-Torrelio C, Ross N, Bogich TL, Daszak P. (2017) Host and viral traits predict zoonotic spillover from mammals. **Nature** 546(7660):646–650.

Allen T, Murray KA, Zambrana-Torrelio C, Morse SS, Rondinini C, Di Marco M, Olival KJ, Daszak P. (2017) Global correlates of emerging zoonoses: Anthropogenic, environmental, and biodiversity risk factors. **Nature Communications** 8:1124.

Lim SS, … Zambrana-Torrelio C , *et al.* (2016) Measuring the health-related Sustainable Development Goals in 188 countries: A baseline analysis from the Global Burden of Disease Study 2015. **The Lancet** 288:1813-1850.

Murray KA, Preston N, Allen T, Zambrana-Torrelio C, Hosseini PR & P Daszak. (2015) Global biogeography of human infectious diseases. **Proceedings of the National Academy of Sciences** 12(41):12746-12751.

Anthony SJ, Islam A, Johnson C, Navarrete-Macias I, Liang E, Jain K, Hitchens PL, Che X, Soloyvov A, Hicks AL, Ojeda-Flores R, Zambrana-Torrelio C, Ulrich W, *Rostal MK*, Petrosov A, Garcia J, Haider N, Wolfe N, Goldstein T, Morse SS, Rahman M, Epstein JH, Mazet JK, Daszak P & Lipkin WI. (2015) Non-random patterns in viral diversity. **Nature Communications** 6:8147.

Loh EL, Zambrana-Torrelio C, Olival K, Bogich T, Johnson CK, Mazet J, *Karesh W*, Daszak P. (2015) Targeting transmission pathways for emerging zoonotic disease surveillance and control. **Vector-Borne and Zoonotic Diseases** 15:432-437.

Daszak P, Zambrana-Torrelio C, Bogich TL, Fernández M, Epstein JH, Murray KA, Hamilton H. (2013) Interdisciplinary approaches to understanding disease emergence: The past, present, and future drivers of Nipah virus emergence. **Proceedings of the National Academy of Sciences** 110:3681-3688.

Morse SS, Mazet JA, Woolhouse M, Parrish CR, Carroll D, *Karesh WB*, Zambrana-Torrelio C, Lipkin WI, Daszak P. (2012) Prediction and prevention of the next pandemic zoonosis. **The Lancet** 380:1956–1965.

Justine Alphonce Assenga
Ministry of Livestock and Fisheries, Box 2870, Dodoma, Tanzania
E-mail: assengakanda@yahoo.com

Professional Preparation

Sokoine Univ of Agric.	Veterinary Medicine	BVM	1996
Sokoine Univ of Agric.	Veterinary Medicine	MVM	2003
Sokoine Univ of Agric.	Molecular Epidemiology	PhD	2016

Appointments

Animal Health Focal Person - OHCD, Ministry of Livestock and Fisheries	2016 - present
Deputy Principal, Livestock Training Institute	2005 - 2014
Assistant Coordinator of Studies, Livestock Training Institute	2003 - 2005

Selected Publications

Pieracci EG, Scott TP, Coetzer A, Athman M, Mutembei A, Kidane AH, Bekele M, Ayalew G, Ntegeyibizaza S, Assenga J, Markalio G. (2017) The formation of the Eastern Africa Rabies Network: A sub-regional approach to rabies elimination. **Tropical Medicine and Infectious Disease** 2(3):29.

Mwakapeje ER, Assenga JA, Kunda JS, Mjingo EE, Makondo ZE, Nonga HE, Mdegela RH, Skjerve E. (2017) Prevention, detection, and response to anthrax outbreak in Northern Tanzania using one health approach: A case study of Selela ward in Monduli district. **International Journal of One Health** 3:66-76.

Assenga JA, Matemba LE, Malakalinga JJ, Muller SK, Kazwala RR. (2016) Quantitative analysis of risk factors associated with brucellosis in livestock in the Katavi-Rukwa ecosystem, Tanzania. **Tropical Animal Health and Production** 48(2):303-309.

Muller SK, Assenga JA, Matemba LE, Misinzo G, Kazwala RR. (2016) Human leptospirosis in Tanzania: Sequencing and phylogenetic analysis confirm that pathogenic Leptospira species circulate among agro-pastoralists living in Katavi-Rukwa ecosystem. **BMC Infectious Diseases** (16)1:273.

Assenga JA, Matemba LE, Muller SK, Mhamphi GG, Kazwala RR. (2015) Predominant Leptospiral serogroups circulating among humans, livestock and wildlife in Katavi-Rukwa ecosystem, Tanzania. **PLoS Neglected Tropical Diseases** 9(3): e0003607.

Assenga JA, Matemba LE, Muller SK, Malakalinga JJ, Kazwala RR. (2015) Epidemiology of *Brucella* infection in the human, livestock and wildlife interface in the Katavi-Rukwa ecosystem, Tanzania. **BMC Veterinary Research** 11(1):189.

Machang'u RS, Mgode GF, Assenga J, Mhamphi G, Weetjens B, Cox C, Verhagen R, Sondij S, Goris MG, Hartskeerl RA. (2004) Serological and molecular characterization of Leptospira serovar Kenya from captive African giant pouched rats (*Crycetomys gambianus)* from Morogoro, Tanzania. **FEMS Immunology and Medical Microbiology** 41(2):117-121.

Machang'u R, Mgode G, Assenga J, Mhamphi G, Hartskeerl R, Goris M, Cox C, Weetjens B, Verhagen R, Singleton GR, Hinds LA. (2003) Characterization of Leptospira isolates from captive giant pouched rats, *Cricetomys gambianus*. **Rats, Mice and People, Rodent Biology and Management.(Eds) Singleton GR, Hinds LA, Krebs CJ, and Spratt MD. Australian Centre for International Agricultural Research, Canberra.** 2003:40-42.

Jubilate Bernard Minja
Ministry of Health, Community Development, Gender, Elderly and Children,
University of Dodoma, Building No.11, P.O. Box 743, 40478 Dodoma Tanzania
E-mail: jubbybm@yahoo.com

Professional Preparation

University of Dar es Salaam	Environmental Health Sciences	BSc	2005
Tumaini University	Public Health	MPH	2008

Appointments

Head, Vectors and Vector Borne Diseases Control, MOHCDGEC	2017 - present
Focal Person for Human Health in One Health Coordination Desk	2016 - present
Focal Person for One Health, MOHCDGEC	2016 - present
National Coordinator, Tanzania-Cuba Larviciding Project	2011 - 2011
Malaria Vector Control Section (Head from 2009- 2011)	2006 - 2011

Selected Publications

Mghamba JM, Tasiluna AO, Suryantoro L, Saguti GE, Muita M, Bakari M, Rusibamayila N, Ally M, Bernard J, Banda R, Mapunda M, Eidex R, Sreedharan R, Sliter K, Nikkari S, Saikat S, Longo GPM, Verboom P, Yahaya AA, Chungong S, Rodier G, Fall IS. (2018) Developing a multisectoral National Action Plan for Health Security to implement IHR (2005) in Tanzania. **BMJ Global Health** 3(2):e000600.

Kabula B, Tungu P, Malima R, Rowland M, Minja J, Wililo R, Ramsan M, McElroy PD, Kafuko J, Kulkarni M, Protopopoff N, Magesa S, Mosha F, Kisinza W. (2013) Distribution and Spread of pyrethroids and DDT resistance among the *Anopheles gambiae* complex in Tanzania. **Medical and Veterinary Entomology** 28(3):244-252.

Kabula B, Tungu P, Matowo J, Kitau J, Mweya C, Emidi B, Masue D, Sindato C, Malima R, Minja J, Msangi S, Njau R, Mosha F, Magesa S, Kisinza W. (2012) Susceptibility status of malaria vectors to insecticides commonly used for malaria control **Tropical Medicine & International Health** 17(6):742-750.

Bernard J, Mtove G, Mandike R, Mtei F, Maxwell C, Reyburn H. (2009) Equity and Coverage of insecticide treated bednets in an area of intense transmission of *Plasmodium falciparum* in Tanzania. **Malaria Journal** 8(1):65.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Sarah Cleaveland

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Eliminating human rabies: Impact of enhanced vaccination coverage

Source of Support: NIH
Total Award Amount: $2,340,659 Total Award Period Covered: 11/20/2018 – 9/30/2023
Location of Project: Tanzania
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Furaha Mramba

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Eliminating human rabies: impact of enhanced vaccination coverage

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding Rift Valley Fever in the Republic of South Africa

Source of Support: DTRA
Total Award Amount: $4,936,359.00 Total Award Period Covered: 5/17/2014-5/16/2019
Location of Project: EcoHealth Alliance, South Africa
Person-Months Per Year Committed to the Cal: 2.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding the Risk of Bat-Bourne Zoonotic Disease Emergence in Western Asia

Source of Support: DTRA
Total Award Amount: $4,391,443.65 Total Award Period Covered: 10/2/2017 – 10/1/2022
Location of Project: Global
Person-Months Per Year Committed to the Cal: 1.1 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Ground Truth Network

Source of Support: DTRA
Total Award Amount: $2,231,114.13 Total Award Period Covered: 9/30/2016 – 9/29/2021
Location of Project: United States
Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 5.5 Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

READY: Augmenting Capacity for Humanitarian Emergencies of Infectious Diseases with Epidemic or Pandemic Potential

Source of Support: USAID

Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018-09/30-2021

Location of Project: Global

Person-Months Per Year Committed to the Cal: 0.72 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Center for Research in Diagnostics and Discovery

Source of Support: National Institutes of Health

Total Award Amount: $345,003 Total Award Period Covered: 3/7/2014 – 2/29/2020

Location of Project: New York, NY

Person-Months Per Year Committed to the Cal:0.96 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA

Total Award Amount: $4,988,526.00 Total Award Period Covered: 6/1/2019-5/31/2024

Location of Project: EcoHealth Alliance, South Africa

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☒ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia

Source of Support: DTRA

Total Award Amount: $2,700,000 Total Award Period Covered: 1/1/2020-12/31/2022

Location of Project: EcoHealth Alliance, Liberia

Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Strengthening biosurveillance and early detection capabilities for MERS-CoV and other coronaviruses in USCENTCOM and USEUCOM

Source of Support: GHERI

Total Award Amount: $2,849,106 Total Award Period Covered: 11/01/2019-10/31/2022

Location of Project: United States, Georgia, Jordan

Person-Months Per Year Committed to the Cal: 0.5 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Carlos Zambrana-Torrelio	Other agencies (including NSF) to which this proposal has been submitted: N/A

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Project. Cal: 5.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
PREDICT-2

Source of Support: USAID
Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/1/2014-9/30/19
Location of Project: EcoHealth Alliance, Jordan, Egypt, Liberia, Bangladesh, China, Indonesia, Malaysia, Thailand
Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project: Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project: EcoHealth Alliance, Bangladesh
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Brian Willett

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Eliminating human rabies: impact of enhanced vaccination coverage

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Blandina Mmbaga	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA

Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024

Location of Project: EcoHealth Alliance, Tanzania

Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Developing Capacity to Improve Care Transitions for Injury Patients in Tanzania

Source of Support: NIH

Total Award Amount: $131,000 Total Award Period Covered: 2/1/2018-1/31/2020

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: .96 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Diagnostics and Pharmacotherapy for Severe Forms of TB

Source of Support: NIH/NIAID

Total Award Amount: $430,831 Total Award Period Covered: 08/01/2015-07/31/2019

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: A stigma reduction intervention at time of entry into antenatal care to improve PMTCT services

Source of Support: NIH

Total Award Amount: $235,000 Total Award Period Covered: 07/01/2018-06/31/2020

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: International and Domestic Pediatric and Maternal HIV and Other High Priority Infectious Dis-

Source of Support: WESTAT/NICHD

Total Award Amount: $1,023,00 Total Award Period Covered: 12/01/2017-11/31/2022

Location of Project:

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Felix Lankester	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA

Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024

Location of Project: EcoHealth Alliance, Tanzania

Person-Months Per Year Committed to the Cal: 2.75 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Supporting Evidence-Based Interventions to Achieve Agricultural Development Goals (SEBI) –

Source of Support: University of Edinburgh

Total Award Amount: $104,370 Total Award Period Covered: 03/01/2017-08/31/2019

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Eliminating human rabies – Enhanced Vaccination Strategies

Source of Support: National Institute of Health – R01

Total Award Amount: $2,399,307 Total Award Period Covered: 11/01/2018-10/31/2023

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: 5.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Assessment of incentive payments for increasing participation in mass dog rabies vaccination in

Source of Support: Washington State University

Total Award Amount: $20,000 Total Award Period Covered: 10/01/2017-07/30/2019

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Thermotolerance: catalyzing widespread vaccination delivery and elimination of canine rabies?

Source of Support: MSD Animal Health

Total Award Amount: $245,137 Total Award Period Covered: 09/01/2017-08/31/2020

Location of Project:

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Jubilate Bernard Minja

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,847,271 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Eliminating human rabies: impact of enhanced vaccination coverage

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Venance P. Maro

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: Tanzania
Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Investigating Febrile Deaths in Tanzania (INDITe)

Source of Support: NIAID
Total Award Amount: $587,087 Total Award Period Covered: 01/01/2016-12/31/2020
Location of Project: Tanzania
Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Justine Assenga	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024
Location of Project: EcoHealth Alliance, Tanzania
Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Eliminating human rabies: impact of enhanced vaccination coverage

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Roger Hewson

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Crimean-Congo hemorrhagic fever: reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA

Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024

Location of Project: Tanzania

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Ecological and Epidemiological Investigation of Crimean-Congo hemorrhagic fever virus (CCHFV) in Azerbaijan.

Source of Support: DTRA

Total Award Amount: $756,332.68 Total Award Period Covered: 04/01/2019 – 03/31/2021

Location of Project: Azerbaijan

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Julius Keyyu

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania (current proposal)

Source of Support: DTRA

Total Award Amount: $4,848,483 Total Award Period Covered: 10/1/2019-07/31/2024

Location of Project: EcoHealth Alliance, Tanzania

Person-Months Per Year Committed to the Cal: 0.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Eliminating human rabies: impact of enhanced vaccination coverage

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

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Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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ATTACHMENTS FORM

Instructions: On this form, you will attach the various files that make up your grant application. Please consult with the appropriate Agency Guidelines for more information about each needed file. Please remember that any files you attach must be in the document format and named as specified in the Guidelines.

Important: Please attach your files in the proper sequence. See the appropriate Agency Guidelines for details.

1) Please attach Attachment 1	1238-Rostal Statement of Work		Delete Attachment	View Attachment
2) Please attach Attachment 2	1239 Rostal CCHF Quad Chart.p		Delete Attachment	View Attachment
3) Please attach Attachment 3	1240-Attachment 3 - CCHF_Vina		Delete Attachment	View Attachment
4) Please attach Attachment 4		Add Attachment		
5) Please attach Attachment 5		Add Attachment		
6) Please attach Attachment 6		Add Attachment		
7) Please attach Attachment 7		Add Attachment		
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		
11) Please attach Attachment 11		Add Attachment		
12) Please attach Attachment 12		Add Attachment		
13) Please attach Attachment 13		Add Attachment		
14) Please attach Attachment 14		Add Attachment		
15) Please attach Attachment 15		Add Attachment		

ATTACHMENT 3 – SUPPORTING DOCUMENTATION

1) FOREIGN PRINCIPLE INVESTIGATORS AND OTHER MEMBERS OF FOREIGN RESEARCH TEAM.

Complete details and biosketches provided in the **Research and Related Senior/Key Person Profile Form**

Foreign PIs (alphabetical order):

Dr. Felix Lankester
Assistant Professor, Paul G Allen School for Global Animal Health
Washington State University, Pullman, WA, 99164, USA
Dr. Blandina Mmbaga
Research Director
Kilimanjaro Clinical Research Institute, KCRI 2236 Moshi, Tanzania
Dr. Furaha Mramba
Chief Executive Officer of Tanzania
Veterinary Laboratory Agency, P.O. Box 9254, Dar-es-salaam, Tanzania

Other members of Key Personnel (alphabetical order):

Dr. Justine Assenga
Animal Health Focal Person – One Health Coordination Desk,
Ministry of Livestock and Fisheries, Box 2870, Dodoma, Tanzania

Ms. Jubilate Bernard Minja
Focal Person for Human Health – One Health Coordination Desk
Ministry of Health, Community Development, Gender, Elderly and Children, University of Dodoma, Building No.11, P.O. Box 743, 40478 Dodoma, Tanzania

Dr. Roger Hewson
Scientific Leader - Viral Hemorrhagic Fevers & Arboviruses
Virology & Pathogenesis Group, National Infection Service, Public Health England, United Kingdom

Dr. Julius Dotto Keyyu
Director of Research Development and Coordination, Tanzania Wildlife Research Institute (TAWIRI) , Box 661, Arusha Tanzania

Dr. Venance Maro
Chief, Department of Medicine, Kilimanjaro Christian Medical Centre
KCRI 2236 Moshi, Tanzania

Brian James Willett
Professor of Viral Immunology
University of Glasgow Centre for Virus Research Garscube Estate, Glasgow G61 1QH, United Kingdom

Carlos Zambrana-Torrelio
Associate Vice President for Conservation and Health
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA

2) DESCRIPTION OF RELATIONSHIP BETWEEN PROJECT AND CURRENT RESEARCH EFFORTS OF FOREIGN RESEARCH TEAM

American co-PI Sarah Cleaveland is a Professor of Comparative Epidemiology at the University of Glasgow (UoG) and the leader of the foreign research team at UoG. Co-PI Cleaveland has been working on zoonotic diseases in northern Tanzania for more than 20 years. Co-PI Cleaveland has previously worked with PI Rostal on a related bunyavirales virus, Rift Valley fever virus, as well as co-PI Mmbaga, co-PI Lankester and KP Keyyu. Co-PI Cleaveland has focused her research on identifying animal reservoirs of infection, understanding risk factors for new and emerging infectious diseases, quantifying the burden of disease, understanding infection dynamics in linked human and animal populations, designing cost-effective disease control strategies that benefit public health, livestock economies and wildlife conservation, and exploring innovative strategies for surveillance of emerging and zoonotic diseases.

Foreign co-PI Blandina Mmbaga is the Research Director at the Kilimanjaro Clinical Research Institute (KCRI). Co-PI Mmbaga has been a practicing physician in northern Tanzania for over a decade and is interested in better understanding the burden of tick-borne diseases in the local patient population, specifically that of CCHF. Co-PI Mmbaga supported the creation of the Zoonoses Laboratory at KCRI, which can process both human and animal samples and supports using a One Health approach to determining zoonotic disease risk to populations in northern Tanzania. Co-PI Mmbaga has previously worked closely with co-PIs Cleaveland and Lankester.

Foreign co-PI Furaha Mramba is the Chief Executive Officer of the Tanzania Veterinary Laboratory Agency (TVLA). Co-PI Mramba has collaborated with co-PIs Cleaveland and Lankester previously. TVLA has a mandate to support research and animal diagnostic capabilities – both of which will be met through this proposed project. Co-PI Mramba is a trained entomologist and will support her staff in identifying *Hyalomma* spp. ticks collected by the proposed project. Finally, TVLA supports One Health communication and understands the important role that animals play in the maintenance of CCHFV despite the fact that it is only known to cause diseases in people.

Foreign co-PI Lankester is a professor at Washington State University (WSU) as well as the Vice President of WSU's non-profit subsidiary Global Animal Health Tanzania (GAHT). GAHT is legally registered in Tanzania to facilitate in-country research and support research capacity-building activities on zoonotic infectious diseases. Co-PI Lankester has worked at the intersection of human and domestic animal health for in Tanzania for a decade and has collaborated closely with co-PIs Cleaveland and Mmbaga, and he has previously worked with co-PI Mramba and KP Keyyu.

The Tanzania Wildlife Research Institute (TAWIRI) is the government agency mandated to conduct and coordinate research with wildlife in Tanzania. KP Keyyu has previously worked with co-PIs Cleaveland and Lankester. TAWIRI supports this CCHF project proposal as they understand the importance of investigating the ecology of zoonoses in wildlife, even if they do not affect the wildlife. This in turn supports the One Health collaboration among the Tanzanian partners. TAWIRI has begun collecting additional aliquots of samples for this proposed project to use in assessing the infection rates of CCHF in wildlife.

The Tanzanian One Health Coordination Desk-Prime Minister's Office (OHCD-PMO), has prioritized viral hemorrhagic fevers (which includes CCHF) as one of the six priority zoonoses.

Tanzania is focusing its efforts of threat reduction on these zoonoses and CCHF is counted among them. The OHCD-PMO is tasked with coordinating research efforts on these six zoonoses and their collaboration on this proposed project will support their aims of threat reduction.

Public Health England (PHE) – Porton Down has been conducting research on CCHFV since 1958, but have not yet studied the virus in Tanzania. PHE has a BSL-4 containment laboratory and the capacity to conduct viral neutralization testing for CCHFV. They have experience conducting many laboratory trainings for select agents, including those specifically on CCHFV. PHE has shared reagents and previously collaborated with KP Willett (UoG).

3) FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance (EHA)

EcoHealth Alliance is a New York-based 501(c)(3) non-profit institution that conducts scientific research on emerging zoonoses and global health capacity building. EcoHealth Alliance New York headquarters has 10,000 square feet of office space including a meeting room. The scientific staff (34 core scientists, 100+ field staff) is supported by a core admin staff of 18 who are available for work on this project and funded through private donor and federal support. EcoHealth Alliance does not support diagnostic facilities at its core headquarters and works in partnership with a network of leading diagnostic labs both in the U.S.A. and around the world.

EcoHealth Alliance is equipped with fiber optic Internet access and video conferencing facilities to facilitate easy communication between collaborators. EcoHealth Alliance employees have around-the-clock access to servers, VPNs, encryption software, IT support, and all necessary software including Git and Github (Hosted software revision/audit service), Sublime and Vim text editors, Vagrant and Oracle Virtualbox virtual machines, Google Apps (Hosted email and collaboration web based software), Ansible (Server provisioning software framework), Python, NodeJS, and R programming languages, Meteor (Javascript framework), Bash shell scripts, Jenkins (Continuous Integration server), Microsoft Office and Adobe CS6 running on both Apple Mac OS X, Ubuntu linux, and Windows Operating Systems. EcoHealth Alliance has a dedicated quad-core Linux server and another dedicated dual quad-core Mac Pro Server - each with 4TB hard drives. Either server individually or in combination may be used for intensive computational modeling and/or database processing by all the grantees. Access to the cloud and supercomputing services (Amazon) is provided by core funding to EcoHealth Alliance.

EcoHealth Alliance is the headquarters of a global network of over 70 partners that provides exceptional leverage for the core scientists. This network includes staff from: academic institutions at leading national universities; intergovernmental agencies (WHO, OIE, FAO, DIVERSITAS, IUCN); infectious disease surveillance laboratories including BSL-3 and -4 laboratories; national government agency offices and labs; locally-based wildlife conservation organizations in Asia, Africa and Latin America. EcoHealth Alliance is the headquarters of: The Consortium for Conservation Medicine (CCM); the journal EcoHealth; an NSF Research Coordination Network (EcoHealthNET); the IUCN Wildlife Health Specialist Group; and the OIE Wildlife Health Network. EcoHealth Alliance is a voting member of the IUCN and a partner in Columbia University's Earth Institute Center for Environmental Sustainability (EICES) and all senior scientific staff members are Adjunct Faculty at Columbia University's Department of Ecology, Evolution, and Environmental Biology or at the Mailman School of Public Health.

University of Glasgow (UoG)

The Institute of Biodiversity, Animal Health and Comparative Medicine (IBAHCM) is one of seven Research Institutes in the College of Medical, Veterinary & Life Sciences (MVLS) created in 2010 in a major restructure that brings together three biomedical faculties with over 400 academic staff, involved over £100 million invested in research infrastructure and facilities and allows a high degree of integration across departments and disciplines. The Institute has been awarded The Queen's Anniversary Prize for innovative research in global health, an Athena SWAN Institutional Silver Award in recognition of commitment to gender equality for recruitment, career development and progression of our staff and students, the European Commission "Excellence in Research" award and the BBSRC award for Innovator of the Year (2017) in the category of international impact in recognition of its work in Tanzania. Facilities at IBAHCM include office space, computing resources, university library resources with facilities for the CCHF laboratory work provided through the MRC-University of Glasgow Centre for Virus Research (CVR). Academic facilities will also be available through interdisciplinary centers that involve researchers from across the University, including the Boyd Orr Centre for Population and Ecosystem Health, the Glasgow Centre for International Development and the One Health Research in Bacterial Infectious Diseases.

In Tanzania, the Institute has a strong research platform established in partnership with Tanzanian institutions, with facilities that include secure accommodation (a 2-bedroom research house) at the Kilimanjaro Christian Medical Centre, dedicated office space at the Kilimanjaro Clinical Research Institute (KCRI) with access to information and communications technology (ICT) and data management support, and two 4x4 field vehicles for use by project staff, in addition to field vehicles available for zoonoses research at partner institutions. The University of Glasgow research team provided support for establishment of the zoonoses laboratory at the KCRI biotechnology laboratory with capacity for processing and archiving animal samples (including -80^{0}C freezers), microbiology, molecular diagnostics and serological analyses.

The MRC-UoG CVR occupies a state-of-the-art purpose-built facility within the Garscube campus of the University of Glasgow. The CVR provides a well-equipped and intellectually stimulating environment, and has all the features necessary to carry out the proposed project. Excellent infrastructures and equipment are available for molecular biology and virology. These include automatic robotic systems for high throughput assays, confocal microscopy (including live cell imaging), electron and cryo-electron microscopy (the CVR is home to the Scottish Macromolecular Imaging Centre), qPCR machines, phosphoimagers, luminometers, fluorimeters, a nanoparticle detection system and several FACS machines and cell sorters. The CVR's genomics and bioinformatics hub operates an Illumina MiSeq platform and provides dedicated sequencing and bioinformatics analysis support. In addition to extensive category 2 tissue culture facilities, the CVR also has a category 3 high containment suite and insectaries.

Tanzania Veterinary Laboratory Agency (TVLA)

Tanzania Veterinary Laboratory Agency (TVLA) is a government agency focused on promoting animal health welfare through animal disease and vector research, surveillance and diagnostic services to livestock stakeholders in order to enhance food safety, food security and the national economy. TVLA was established under the Executive Agency Act Cap 245 (Revised Edition; R.E 2009) and became operational in July, 2012.

TVLA has 11 laboratory centers that are strategically located to provide services to livestock farmers across the country. Nine of them conduct diagnosis services. In each center there is

diagnostic equipment such as ELISA machines, PCR machines, microscopes, computers, and laboratory buildings. There are 190 working staff. The agency is equipped with 11 networking computers which are linked by SiLabs, a web-based laboratory information management system.

Kilimanjaro Clinical Research Institute (KCRI)

The Kilimanjaro Christian Medical Centre (KCMC) is located in Moshi, Tanzania at the base of Mount Kilimanjaro. KCMC is one of four referral hospitals in Tanzania, and it serves a catchment area of 15,000,000 persons. Research is central to the mission of KCMC, and a robust research infrastructure has been developed under the Kilimanjaro Clinical Research Institute (KCRI). The three Good Samaritan Foundation (GSF) entities have complementary roles in achieving their mission; healing (KCMC), training (KCMU College), and research (KCRI). The vision of KCRI is to be an internationally recognized center of excellence in health research, embedded in the academic medical setting of KCMC, the Tanzanian health care system and connected to international research networks. KCRI provides research training and necessary research infrastructure and logistics for KCMC/KCMU College investigators, and their collaborating partners. KCRI hosts both investigator-initiated single site studies in addition to being a member of multiple consortia such as East African Consortium for Clinical Research (EACCR), Esophageal Squamous Cell Carcinoma African PrEvention research (ESCCAPE), Ministry of Foreign Affairs Denmark (DANIDA), European and Developing Countries Clinical Trials Partnership (EDCTP), PhArmaco VIgilance Africa (PAVIA), and the TB Alliance. KCRI has collaborations with other international universities including Duke University and University of Virginia in the U.S., the University of Glasgow, the London School of Tropical Medicine and Hygiene and St Andrew's in the UK, and St. Radboud University in the Netherlands.

KCRI has been participating in infectious disease studies and clinical trials including those on febrile illness, bacterial zoonosis and antimicrobial resistance. The research institution has the capacity to do blood culture and sensitivity equipped by the BacT/ALERT, recently received a BioFire from the U.S. Department of Defense to conduct a validation analysis on the identification of infectious agents. Through the University of Virginia and CDC, KCRI has analyzed national outbreak samples using the TaqMan array cards using real--time PCR Vii7. The laboratory is also equipped with a whole genome sequencing (WGS) machine (Illumina MiSeq) for performing molecular identification of antimicrobial resistant genes. The laboratory technicians are experienced in conducting febrile illness studies as well as the isolation of bacterial and other organisms. KCRI has a BSL-2 zoonoses laboratory that analyzes human and animal samples for zoonoses including, brucellosis, leptospirosis, and testing for residual antibiotics in poultry products. Additional equipment includes a BSC-II, centrifuge, autoclave, pipettors and other standard laboratory equipment.

KCMC/KCRI have been performing clinical trials on HIV/AIDS drugs as part of the AIDS Clinical Trial Group (ACTG) and the International Maternal Pediatric Adolescent AIDS Clinical Trial (IMPAACT) under NIAID-NIH since 2007. Since 2013, the site has been working under the National Institute of Child Health and Human Development (NICHD) WESTAT for IMPAACT clinical trials studies for maternal, adolescent and pediatric HIV and TB clinical trials. KCRI is interested in extending its activities to include other infectious diseases of public health importance such as malaria, HIV and tuberculosis, emerging and reemerging diseases such as dengue and Chikungunya.

Washington State University (WSU)

The proposed research will leverage existing Washington State University (WSU), research facilities, capacity, and scientific personnel in the U.S. and in Tanzania. The Paul G. Allen School for Global Animal Health is administratively located within the College of Veterinary Medicine on the WSU campus in Pullman, WA. Its facilities include the Allen Center, a 62,000 sq. ft. state-of-the-art biomedical research facility fully equipped for research in molecular biology and infectious diseases, including 5,000 square feet of certified BSL-3 space, two floors of BSL-2 laboratories, private offices for 16 investigators adjacent to the laboratories and open plan work space for graduate students and postdoctoral associates. The Allen Center also provides common areas on each floor, a classroom and conference rooms with capacity for global connection, and a full suite of administrative staff and services. The Allen School administrative team works closely with WSU's central services for all grant administration, including the Office for Research Support and Operations and the Sponsored Programs Services unit.

WSU is legally registered to conduct research in Tanzania and the co-PI, Felix Lankester, and all scientific personnel conducting research in Tanzania have legal approval through Tanzania's Commission for Science and Technology (COSTECH). WSU maintains an office in Arusha to support the co-PIs and other WSU investigators with local procurement, accounting, research permitting, and logistics. The office is equipped with internet-connected and networked computers and uses accounting software fully compliant with WSU standards. Specific to disease surveillance field work, there is a team of trained field staff, led by a veterinarian trained and registered in Tanzania, that is highly experienced in all aspects of field work and data collection.

Field research is supported by five facilities including the WSU office in Arusha for administration, accounting, and logistics; a field center in Seronera (Serengeti National Park), which is close to all of the study sites of the proposed study, and provides telephone communication and living quarters for field teams and visiting project scientists, storage of field equipment, short-term biological sample storage, post-mortem kits, and personal protective equipment; a cold room facility based at the Tanzanian Veterinary Laboratory Agency in Mwanza with the capacity to store vaccines and other temperature sensitive material under monitored conditions; and modern research laboratories at the Nelson Mandela African Institution of Science and Technology (NM-AIST) funded by the Paul G. Allen School for Global Animal Health that provide molecular and serological diagnostic instrumentation and freezers for long-term sample storage. Additionally, WSU provides and supports vehicles required for field research in Tanzania through funding provided to Global Animal Health Tanzania.

Global Animal Health Tanzania (GAHT)

The co-PI Dr. Felix Lankester is based in Arusha, Tanzania where he is a Director of Global Animal Health Tanzania (GAHT), a not for profit non-governmental organization registered in Tanzania to facilitate infectious disease surveillance and research. GAHT occupies a small office space in Arusha from which the project's activities are coordinated. The office is equipped with internet connected computers, printers and other essential office furniture.

GAHT works in close association with the Nelson Mandela African Institute for Science and Technology (NMAIST) whose campus and extensive laboratory facilities are 5 km from the GAHT office. The laboratory facilities, which GAHT has access to, contain molecular and serological diagnostic equipment and sample storage facilities. GAHT owns a field-ready 4-wheel drive vehicle, which is based at the office in Arusha, and three Land Rover Discovery vehicles, which are based at the project house. The team consists of 4 field staff and a Project Manager who is a Tanzanian trained veterinary doctor. Four have been working for GAHT for between five and ten years and all are extremely experienced at carrying out infectious disease field program activities, including data collection using handheld digital devices. In addition, the Project Manager is extremely well connected within the Tanzanian veterinary community and works closely with all of the District Veterinary Officers based in the proposed study site.

GAHT owns a large liquid nitrogen canister, used for storing biological samples prior to virological analyses. There are several nearby facilities (Arusha and Mwanza) with functioning liquid nitrogen compressors that GAHT staff visit regularly to top up the canister. Additionally, they own two - 20°C deep freezers, used for preserving biological samples, which are stored in the dedicated GAHT lab space at the NMAIST lab along with three 12-volt mobile fridge / freezers, used for the transportation and temporary storage of vaccines and other temperature sensitive items. GAHT has contributed to the construction of a cold room facility based at the Tanzanian Veterinary Laboratory Agency lab in Mwanza, western Tanzania. This facility is used by GAHT to store temperature sensitive materials prior to shipment to the field.

One Health Coordination Desk, Dodoma, Tanzania

The One Health Coordination Desk is part of the Office of the Prime Minister (OHCD-PMO) in Dodoma, Tanzania with a mission to reinforce Tanzania's ability to detect, prevent, and respond to emerging pandemics, support Tanzania's commitment to implementing Global Health Security Agenda regulations, and create a solid foundation for effective preparedness and response activities. The OHCD-PMO has office space for the four staff members and is equipped with telephones, internet and computers with Microsoft Office programs for staff.

Public Health England-Porton Down, Wiltshire U.K.

The Public Health England (PHE) is an executive agency, sponsored by the Department of Health and Social Care. It is a distinct organization with operational autonomy that provides government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific expertise. PHE employs over 5,000 staff which are mostly scientists, researchers and public health professionals at 8 centers.

The PHE facility at Porton Down focuses on a range of hazardous pathogens including those in hazard groups 3 and 4 which mandate specialist laboratory infrastructure such as Containment Level 3 (CL3) or maximum containment at CL4 for work with infectious agents. PHE-Porton is located 7 miles northeast of Salisbury, Wiltshire, UK. The facility is situated in a rural setting, remote from main population areas. Physical security is assured by a security fence, which completely surrounds the complex. Video cameras are used to monitor sensitive areas of the facility. Two gates provide access for vehicles and security staff man the guardhouses adjoining these gates, 24 hours a day, 7 days a week. Access to the site requires staff members to display a personal security pass. Staff presence on site is monitored through a 'Swipe' record system.

PHE-Porton is recognized as an international leader in work on high containment pathogens. It performs research into microbiological hazards for the UK's Department of Health as well as providing diagnosis & reference facilities for the NHS and emergency response capabilities for the UK collaborating EU laboratories and the World Health Organization (WHO). It has proven research experience in the study of hazard group 3 and 4 viruses, bacteria, Ricketsiae and toxins.

BSL-4 Laboratories: The UK operates a system of linked microbiological safety cabinets. This system was designed for research and diagnostic work involving a range of organisms now categorized as Hazard Group 4 organisms. The established BSL-4 laboratory envelope at PHE-Porton is integrated with an autoclave for solid and liquid waste, designated high containment liquid effluent waste disposal and HEPA filtered supply and extract ventilation systems. There are two BSL-4 suites within PHE-Porton a linked cabinet laboratory line for in vitro virology and a flexible-film containment animal facility. These laboratory suites are located within restricted containment facilities designed to comply with national and international BSL-4 requirements.

The cabinet line system of linked Microbiological Safety Cabinet (MSC) Class III, is designed to separate operators from infectious material handled within them, and prevent the leakage of biological particles. The linked cabinets form a solid shell with gloves fitted along one or two sides to enable material to be handled within them. The gloves are securely fitted over ports so as to provide an effective seal.

The institute is a WHO collaborating center for virus research and reference for a range of BSL4 pathogens. It often accepts international samples couriered in a regulated fashion via packaging and transport requirements set out by UN2814 Category A (infectious substance infecting humans) for diagnostics testing at PHE-Porton (e.g. samples from Spanish CCHF cases in 2018).

Tanzania Wildlife Research Institute (TAWIRI)

The Tanzania Wildlife Institute (TAWIRI) was established by Act of Parliament No. 4 of 1980 (CAP 260 R.E. 2002) with the mandate to conduct, coordinate and oversee wildlife research in Tanzania. The overall purpose of TAWIRI is to advise the Government, Management Authorities and the general public on sustainable conservation and utilization of wildlife resources. The Head Office of TAWIRI is in Arusha Municipality in Northern Tanzania, and TAWIRI has five centers strategically distributed in various zones of Tanzania to cater to specific ecosystems (Serengeti, Kingupira, Njiro, Gombe and Mahale). TAWIRI currently has a total of 104 employees with 37 research staff, of which 21 are PhD holders. The research staff is supported by human resource and administration unit, accounts unit, procurement management unit, internal audit unit, and information and education unit.

Among other functions of TAWIRI as stipulated in the Act, function number four entails TAWIRI to carry out research and investigations on wildlife diseases including zoonoses in order to know their causes and suggest rational methods for preventing and controlling their occurrence. In order to achieve this function, TAWIRI has a veterinary section in the organization structure, which currently has six wildlife veterinarians, two laboratory technicians, and two laboratory attendants. TAWIRI has two veterinary laboratories, one being a field veterinary laboratory that is located in Serengeti national park, and secondly a molecular biology laboratory that is located at the Head Office at Njiro in Arusha. TAWIRI veterinary laboratories are equipped with an ELISA machine, tissue section machine, conventional PCR, a -80°C freezer, four -20°C freezers, 3 liquid nitrogen containers (40-45lt capacity each), a dry shipper, 3

dart guns (pneu darts), 2 wildlife capture nets, mist nets, 4 refrigerators, solar panels, two 40KV generators, 1 autoclave and 4 cool boxes, post mortem kits, and water purification system. The laboratories also have all basic laboratory consumables including pipettes, pipette tips, cryovials, latex gloves, alcohol, flasks, tubes, and ethanol. Most importantly, TAWIRI maintains a wildlife biological specimen bank of tissues, whole blood, EDTA blood, heparinized blood, FTA cards, serum, feces, ticks, worms; the specimens date back two decades. These valuable specimens will be readily available for this important project's retrospective CCHFV analysis in wildlife. TAWIRI also hosts a wildlife population database, which is among the largest wildlife population database in Africa. Also, TAWIRI has a GIS unit with four senior experts in all aspects of spatial data analysis and remote sensing. The unit will be very useful in spatial analysis and interpretation of CCHF ecology.

TAWIRI has 52 computers for research and support staff, internet connection and Wi-Fi facilities, and has 17 field vehicles. All these facilities will be availed for use during project activities, as well as office space for project researchers.

4) SYLLABI FOR WORKSHOPS LISTED IN TECHNICAL PROPOSAL

Proposed One Health Field Team *in situ* Training Agenda
*Note all participants attending the training who will work with human subjects will have already completed on-line CITI training.

Day 1:

13:00-14:00	Introduction to CCHF and the CCHF Project
14:00-14:45	Overview of project protocols
14:45-15:00	Break
15:00-16:00	How communities were selected to be invited to participate?
16:00-17:00	Specific protocol on arrival at a community

Day 2:

9:00-10:00	Obtaining consent for animal and human work and the ethics of working with human participants
10:00-11:00	Practice obtaining valid informed consent
11:00-12:00	Lunch
12:00-13:00	Overview of project protocols
13:00-14:00	CCHF Project questionnaires
14:00-14:15	Break
14:15-16:00	Practice giving questionnaires

Day 3:

9:00-9:30	The ethics of working with animals
9:30-10:00	Team member safety in the field
10:00-10:30	Animal safety and handling
10:30-10:45	Break
10:45-11:15	Biohazardous waste management in the field
11:15-12:00	Personal Protective Equipment
12:00-12:30	Sample management and handling

Proposed CCHF Laboratory Diagnostics Workshop Syllabus for TVLA

	Day 1	Day 2	Day 3	Day 4	Day 5
9:00-10:00	Introduction to CCHF the syndrome	CCHFV ecology/epidemiology	CCHFV positive diagnostic test - what do we do now?	One Health in a laboratory setting	Producing recombinant antigen for human ELISA
10-10:30	Coat ELISA plates for Dowall - human	I. Considerations for potentially working with select agents (CCHFV)	PCR Standard Curve development	Group Photo	
10:30-11:00	BREAK	BREAK	BREAK	BREAK	BREAK
11:00-12:00	CCHFV - the etiological agent and biosecurity	LAB PRAC: CCHFV ELISA training - washing, blocking	LAB PRAC: CCHFV PCR screening known control samples	Preventing zoonoses in the laboratory	EXAM: Written to test knowledge of the relevance of CCHFV and its diagnostics
12:00-13:00		12:00-12:30 II. Considerations for potentially working with select agents (CCHFV)	CCHF is a human disease, why is animal health involved? One Health	LAB PRAC: CCHFV ELISA training - run ELISA	
13:00-14:00	LUNCH	12:30-13:30 LUNCH	LUNCH	13:00-13:45 LUNCH	
14:00-15:00	Safe handling of biohazardous samples	13:00 -14:00 LAB PRAC: CCHFV ELISA training Sample dilution 14:00 -15:15	PCR result interpretation	13:45-15:00 LAB PRAC: CCHFV ELISA training - run ELISA	LUNCH 13:30-14:30
15:00-15:15	BREAK	15:15-15:30 BREAK	BREAK	BREAK	
15:15-16:00	Overview of diagnostic tests available for CCHFV	15:30-16:00 LAB PRAC: CCHFV ELISA training - Add Conjugate	LAB PRAC: CCHFV PCR testing of blind samples	LAB PRAC: CCHFV ELISA training - run ELISA	Closing Remarks and Discussion
					15:45-16:00 BREAK
16:00-16:30	LAB PRAC: CCHFV PCR training - Extraction of RNA from vectors	III. Considerations for potentially working with select agents (CCHFV)		CCHF - communicating CCHF results to the right stakeholders	Awarding of certificates.
16:30-17:00		LAB PRAC: CCHFV ELISA training - Stopping and reading plates	LAB PRAC: CCHFV Multispecies ELISA - Coat ELISA Plates		

Proposed CCHF Laboratory Diagnostics Workshop Syllabus for KCRI

	Day 1	Day 2	Day 3	Day 4	Day 5
9:00-10:00	Introduction to CCHF the syndrome	CCHFV ecology/epidemiology	CCHFV positive diagnostic test - what do we do now?	Communication of CCHF results	Producing recombinant antigen for human ELISA
10-10:30	Coat ELISA plates for Dowall - human	I. Considerations when potentially working with select agents (CCHFV)	III. Considerations when potentially working with select agents (CCHFV)	PCR Standard Curve development	
10:30-11:00	BREAK	BREAK	BREAK	BREAK	BREAK
11:00-12:00	CCHFV - the etiological agent and biosecurity	LAB PRAC: CCHFV ELISA training - washing, blocking	LAB PRAC 2: CCHFV ELISA training - washing, blocking	LAB PRAC: CCHFV PCR screening known control samples	EXAM: Written to test knowledge of the relevance of CCHFV and its diagnostics
12:00-13:00		12:00-12:30 II. Considerations when potentially working with select agents (CCHFV)	12-12:30 When to test for CCHF?	Protocols for isolation of CCHF patients	
13:00-14:00	LUNCH	12:30-13:30 LUNCH	12:30-13:30 LUNCH	LUNCH	
	Safe handling of biohazardous samples	13:00 -14:00 LAB PRAC: CCHFV ELISA training Sample dilution	13:00 -14:00 LAB PRAC 2: CCHFV ELISA training Sample dilution	PCR result interpretation	LUNCH 13:30-14:30
14:00-15:00					Closing Remarks and Discussion
15:00-15:15	BREAK	15:15-15:30 BREAK	BREAK	BREAK	15:45-16:00 BREAK
15:15-16:00	Overview of diagnostic tests available for CCHFV	15:30-16:00 LAB PRAC: CCHFV ELISA training - Add Conjugate	15:30-16:00 LAB PRAC 2: CCHFV ELISA training - Add Conjugate	LAB PRAC: CCHFV PCR testing of blind samples	
16:00-16:30	LAB PRAC: CCHFV PCR training - Extraction of RNA from vectors	LAB PRAC 2: Coat ELISA plates for Dowall - human ; Repeat testing	Group Photo		Awarding of certificates.
16:30-17:00		LAB PRAC: CCHFV ELISA training - Stopping and reading plates	LAB PRAC 2: CCHFV ELISA training - Stopping and reading plates		

Proposed CCHF Policy Workshop Syllabus for OHCD-PMO

<table>
<tr><th></th><th>Day 1</th><th>Day 2</th><th>Day 3</th></tr>
<tr><td>8:30-9:00</td><td>Introduction to CCHFV and a synopsis of its history</td><td rowspan="2">CCHF in East Africa</td><td rowspan="5">Group Work: Developing concrete multisectoral plan/priorities to control threat of CCHF in Tanzania</td></tr>
<tr><td>9:00-9:15</td><td>Official opening</td></tr>
<tr><td>9:15-9:30</td><td>Workshop objective, outputs and outcomes</td><td rowspan="2">Group Work: What does success look like? (metrics)</td></tr>
<tr><td>9:30-10:15</td><td>On Health aspects of infectious diseases in Tanzania</td></tr>
<tr><td>10:15-11:00</td><td>Introduction to CCHFV</td><td>Group Work: A systematic approach to address CCHF I</td></tr>
<tr><td>11:30-11:15</td><td>BREAK</td><td>BREAK</td><td>BREAK</td></tr>
<tr><td>11:00-12:00</td><td>CCHF Project in a nutshell I</td><td rowspan="2">Group Work: A systematic approach to address CCHF II</td><td rowspan="2">Consensus of Policy recommendations by the group</td></tr>
<tr><td>12:00-13:00</td><td>CCHF Project in a nutshell II</td></tr>
<tr><td>13:00-14:00</td><td>LUNCH</td><td>LUNCH</td><td>LUNCH</td></tr>
<tr><td>14:00-14:15</td><td>Group Photo</td><td rowspan="3">Group Work: How can CCHF threat reduction promote progress on other priorities?</td><td rowspan="2">Consensus of Policy recommendations by the group</td></tr>
<tr><td>14:15-14:45</td><td>CCHF Syndrome and impacts</td></tr>
<tr><td>14:45-15:15</td><td>Tanzania's priority pathogens and relevance of CCHF</td><td>14:45-15:00 BREAK</td></tr>
<tr><td>15:15-15:30</td><td>BREAK</td><td>BREAK</td><td rowspan="2">15:00-16:30 Closing remarks, discussion, awarding of certificates.</td></tr>
<tr><td>15:30-16:30</td><td>Group Work: Identify the Ministries that play a key role in controlling CCHF and Defining policy questions to reduce CCHF impacts</td><td>Group Work: Scenarios - optimizing CCHF response</td></tr>
</table>

Post-Doctoral Fellow Mentoring Plan

Summary: The one-year fellow from Tanzanian will be based in New York City at EcoHealth Alliance's (EHA) office. Mentorship will be provided by PI-Rostal and Senior Personnel-Zambrana-Torrelio. EcoHealth Alliance comprises a multi-disciplinary group of 34 scientists, including theoretical ecologists, veterinarians, economists, public health specialists and social-scientists, which will provide exposure to a myriad of different techniques for statistical analysis.

Candidate search: We will recruit a Tanzanian that has completed a Ph.D. or equivalent doctoral degree. We will include specific language in our job postings expressing a preference for candidates with experience in conducting ecology or epidemiology in Tanzania. The candidate will be recruited via a recommendation from partner institutions and/or through posted advertisements for the position in Tanzania and at specific Institutions such as Nelson Mandela University or Sokoine University of Agriculture. Final acceptance will be based on assurances of the candidate's commitment to work in Tanzania at the completion of the fellowship.

Orientation: Orientation will include in-depth conversations between PIs Rostal and Karesh, KP Zambrana-Torrelio and the post-doctoral fellow. Mutual expectations will be discussed and agreed upon in advance. Orientation will include discussion of productivity, including the importance of scientific publications, ethics in research, conflict of interest and work with international collaborators.

Development of Core Competencies: We have developed a one-year multi-disciplinary fellowship that incorporates training in geographic information systems, remote sensing, and spatial ecological analyses. The fellow will become proficient in the following competencies: key concepts in spatial analysis (e.g. vector vs raster), principles in remote sensing, key concepts in infectious diseases, spatial autocorrelation, integrating space and infectious diseases, reproducible research, and open source tools (e.g. R, QGIS, which will allow the fellow to continue his/her work in the future without requiring expensive analytical software).

Supplementary training: At EHA, the fellow will also be trained on the preparation of manuscripts for scientific journals, grant writing and presentation skills. He/she will participate in weekly a journal club/lab meeting to aid scientific development, and will be expected to present his/her research at EHA office, at that year's stakeholder meeting in Tanzania and at least one local or regional conference. The fellow will have to the opportunity to attend seminars hosted by EHA's partners in New York City including Mailman School of Public Health and the Department of Ecology, Evolution and Environmental Biology at Columbia University, and the American Natural History Museum (AMNH). These institutions hold seminars in different topics through the year. The post-doctoral fellow will also have the opportunity to meet with senior researchers working in the field of infectious diseases and One Health.

Experience with Preparation of Grant Proposals: In collaboration with EHA's staff, the post-doctoral fellow will be involved in writing proposals. The researcher will have an opportunity to learn best practices including identification of key research questions, definition of objectives, description of approach and rationale, and construction of a work plan, timeline, and budget.

Publications and Presentations: The fellow will be expected to present and submit publications related to the grant. These will be prepared under the direction of PIs Rostal and Karesh and KP Zambrana-Torrelio and in close collaboration with Co-PIs. The fellow will receive guidance and

training in the preparation of manuscripts for scientific journals and funding to present results at a conference.

Success of the Mentoring Plan: Performance of the fellow will be assessed by monitoring by tracking his/her progress toward his/her career goals through semi-annual performance reviews

5) FOREIGN PI AND KEY PERSONNEL LETTERS OF COLLABORATION

TANZANIA VETERINARY LABORATORY AGENCY

Tel:+255 22 2861152
Fax:+255 22 2864369
Email: ce@tvla.go.tz

Mandela Road,
Temeke Veterinari,
Po. Box 9254,
Dar es Salaam,
TANZANIA.

TVLA

18th January 2019

Dr. Melinda K. Rostal
Eco Health Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

I am writing this letter in support of the "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. As co-PI of the proposed project, I agree to undertake the tasks assigned to me or my organizations, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. As a co-PI, I feel that it is very important for animal health experts work directly with human health professionals toward understanding of the public health impact of CCHF in Tanzania. This project will strengthen the One Health communication between these two sectors.

This project aligns with the work that TVLA is mandated to conduct research in animal diseases and also laboratory analyses on animal diagnostic samples. This project will support our Arusha Centre laboratory and will strengthen its capacity through personnel training and equipment installation. The key factor among these is the installation of a generator at the laboratory that will permit work to be ongoing during electrical outages and maintain the integrity of our sample bank. Additionally, TVLA will host the animal laboratory workshop on CCHF in the third year of the project, which will enhance our relationship with other laboratories. Our Arusha Centre will support the diagnostic and entomological work that is being conducted through this project. I look forward to working closely with you and EcoHealth Alliance and strengthening my relationship with co-PIs Mbaga, Cleaveland and Lankester – whom I have worked with for several years and on several projects. I am confident enough that the team assembled by PI Rostal will successfully execute the project portrayed in the proposal should it be selected for funding.

Thank you

Sincerely yours,

Dr Furaha Mramba
MEDICAL ENTOMOLOGIST
TANZANIA VETERINARY LABORATORY AGENCY

KCRI Kilimanjaro Clinical Research Institute

P.O.BOX 2236
Moshi, Tanzania
Telephone: 255-27-2754201
Fax: 255 27 2753368

Academic Centre for Evidence Based Health Interventions
An institution of the Good Samaritan Foundation

Email: kcriadmin@kcri.ac.tz
Website: http://www.kcmc.ac.tz
Website: http://www.kcri.ac.tz
Date: March 5, 2018

Dr. Melinda K. Rostal

EcoHealth Alliance

460 W 34th St

FL 17

New York, NY 10001

Dear Dr. Rostal,

I am writing this letter in support of the "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. As co-PI of the proposed project, I agree to undertake the tasks assigned to my organizations and myself, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. I have been working in clinical medicine for the past 15 years and Research for the past 10 years. At KCRI we have made significant strides in understanding the burden of zoonotic diseases in Tanzania, but have not yet initiated research on the neglected field of tick borne zoonoses, such as CCHF. I believe this research is critical to improving public health and has merit in improving our understanding of CCHF epidemiology in the region.

CCHF has the potential to occur in Tanzania, especially as we know it occurs with relative frequency in Uganda, and gaining a baseline understanding of the exposure level and exposure risks in people is necessary. This work will support our new Zoonoses Laboratory and it will provide opportunity to improve Tanzania's public health system by training laboratory technicians and providing the assay reagents to their laboratory. I think it is important that this project be initiated and maintained to ensure training is provided year after year to the technicians in our institutions and in the public health laboratories around the northern zone. KCRI with experience of training will host several proposed training to the public health institutions and KCRI staff, trainees and facilitators as needed will utilize infrastructure available. The facility will also be available for sample analysis and storage of collected materials.

The project will strengthen the One Health relationships among the PI and Key Personnel institutions, particularly in animal and public health and in wildlife. I foresee significant mutual benefits as our zoonoses program will benefit and we will provide our expertise to guide the work with human subjects. I look forward to working closely with you and EcoHealth Alliance and strengthening my relationship with co-PIs Cleaveland and Lankester – whom I have worked with for several years and on several projects. I am confident that the team assembled by PI Rostal will successfully execute the project portrayed in the proposal should it be selected for funding.

Sincerely,

Blandina T. Mmbaga MD, Mmed, PhD

Co-investigator

Director KCRI

University of Glasgow | Institute of Biodiversity, Animal Health & Comparative Medicine

March 14th 2019

To Whom It May Concern

RE: Letter of support for Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania

I am writing this letter in support of the proposal entitled "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***". As co-PI of the proposed project, I agree to undertake the tasks assigned to me or my organization, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein.

I have been conducting research on infectious diseases in Tanzania for more than 20 years with an increasing emphasis and focus on One Health approaches to reduce the threat of zoonotic diseases. As such, this proposal on CCHF aligns very closely with the research interests of our Institute as well as Tanzanian partner institutions, and I am very excited by the potential of the project to generate valuable, timely and informative insights on this emerging disease threat.

CCHF is among the viral haemorrhagic fevers that have been identified as a high priority in Tanzania, but very little is known about the disease in Tanzania. As far as I am aware, this will be the first comprehensive investigation in Tanzania of CCHF infection patterns in multiple host species, and associated risk factors in people. In addition, the project is pursuing an interesting hypothesis as to how environmental changes impact the prevalence of the virus and the tick vector. The project will provide training and support for local laboratories to implement CCHF diagnostics and will also help strengthen capacity for tackling tick-borne diseases, which comprise a very important group of emerging diseases. I have a long-standing relationship with our collaborators at TVLA, KCRI and TAWIRI and, through our zoonoses research programme, work closely with the One Health Coordination Desk in Tanzania.

I am confident that the collaboration established within this proposal will strengthen ties both among Tanzanian institutions and between the US and UK institutions. I have worked closely with Dr. Rostal during the past three years as her advisor and will continue to do so while she completes her PhD in epidemiology in the summer of 2019. During this time, she has simultaneously and successfully managed the "Understanding Rift Valley Fever in Republic of South Africa" project as a co-PI (funded by DTRA BTRP/CBEP), and she has my full confidence and support as the PI for this CCHF project.

This project will include key stakeholders in the Tanzanian government at both the national and regional level and provide fundamental data required to support the government in understanding and responding to the threat of a high-priority zoonotic disease.

University of Glasgow | Institute of Biodiversity, Animal Health & Comparative Medicine

Yours sincerely,

Prof. Sarah Cleaveland
Professor, Comparative Epidemiology
Graham Kerr Building
University of Glasgow
Glasgow G12 8QQ
U.K.

Email: sarah.cleaveland@glasgow.ac.uk
Tel: +44 (0) 784 1248374

WASHINGTON STATE UNIVERSITY
The Paul G. Allen School for Global Animal Health

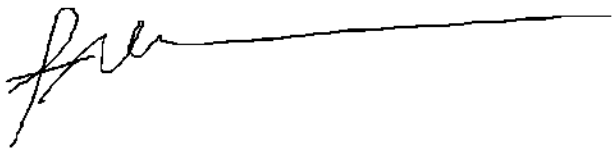
March 14, 2019

Dr. Melinda K. Rostal
EcoHealth Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

I am writing this letter in support of the "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. As co-PI of the proposed project, I agree to undertake the tasks assigned to me or my organizations, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. Based in East Africa, I have been conducting research on zoonotic diseases in Tanzania for the past 10 years. As a representative of Washington State University and Global Animal Health-Tanzania, I have developed a relationship with the One Health Coordination Desk. I believe this project will strengthen that relationship by supporting the One Health Coordination Desk and providing critical data on a priority zoonotic disease. I have worked previously with co-PIs Mbaga and Cleaveland, and Key Personnel Keyyu and Mramba, and I believe that this team has the skills to successfully complete the project objects. Given the lack of research on tick borne zoonoses in Tanzania, specifically for CCHF, this project will be key to providing critically needed data on the epidemiology and ecology of CCHF. Additionally, over the past ten years I have worked closely with the regional veterinary and medical laboratories in northern Tanzania, which, although staffed with enthusiastic personnel, have suffered from a chronic lack of investment and provision of staff training. As such I am very excited that the project will improve capacity of these regional laboratories to conduct molecular and serological testing for CCHF. This capacity development will have a lasting impact on health surveillance in the region.

Yours sincerely,



Felix Lankester
Clinical Assistant Professor
Paul G. Allen School for Global Animal Health
Global Animal Health Tanzania
P.O.Box 1642, Arusha Tanzania

TANZANIA VETERINARY LABORATORY AGENCY

Tel:+255 22 2861152
Fax:+255 22 2864369
Email: furaha.mramba2@tvla.go.tz

Mandela Road,
Temeke Veterinary,
P. O. Box 9254
DAR ES SALAAM.

TVLA

7 March, 2019

Melinda Rostal
Senior Research Scientist
EcoHealth Alliance
New York, NY 10001

Dear Dr. Melinda,

Re: LETTER OF SUPPORT FOR THE UPCOMING PROJECT ENTITLED "A ONE HEALTH APPROACH TO UNDERSTANDING THE EPIDEMIOLOGY OF CRIMEAN-CONGO HEMORRHAGIC FEVER VIRUS IN TANZANIA"

On behalf of the Ministry of Livestock and Fisheries, I write to express my support of the proposed project "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" with Dr Melinda Rostal as the Principal Investigator. This interdisciplinary Tanzania to develop evidence-based strategies for identifying Crimean Congo virus which is an emerging priority heamorrhagic fever that can be spread from animals, especially livestock, to humans.

In my capacity as a Chief Executive of Tanzania Veterinary Laboratory Agency of which TVLA Centre in Arusha where the project will be conducted, I will therefore give all the support which will give us the results that will lead into disease interventions, I am therefore extending my personal support and cooperation to the project.

Yours sincerely,

Dr Joseph Masambu

For Chief Executive
Tanzania Veterinary Laboratory Agency

UNITED REPUBLIC OF TANZANIA
MINISTRY OF LIVESTOCK AND FISHERIES

Telegram: Mifugo
Tel: +255 26 2322611
Fax: +255 22 2861908
Email: ps@mifugo.go.tz

In reply please quote

Nyerere Road
NBC Building
P.O. Box 2870,
40487 DODOMA

11th February 2019

Dr. Melinda K. Rostal
EcoHealth Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

RE: ONE HEALTH COORDINATION DESK TO SUPPORT CRIMEAN-CONGO HAEMORRHAGIC FEVER PROJECT

I am writing in my capacity as Animal Health Focal person at the One Health Coordination Desk, Tanzania in support of the "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. This proposal is focused on obtaining fundamental baseline data on a priority zoonotic disease for Tanzania (viral hemorrhagic fevers) as identified by the One Health Coordination Desk and collaborators. We support this proposal and will be engaged in the project, which will ensure that the Government of Tanzania will be kept appraised of the project's work, results and recommendations. We will co-lead the policy workshop, which will bring together relevant stakeholders to develop policy recommendations based on the outcomes of the field study. We support the involvement of public health, veterinary health and wildlife and environmental health experts in this project and believe that this will strengthen One Health communication amongst these sectors. It will also provide valuable training opportunities for students and young scientists in Tanzania. The One Health Coordination Desk agrees to support the project as described in the proposal. We believe the proposed scientific investigation will provide valuable information on the epidemiology and ecology of CCHFV and importantly conduct the first serosurvey of CCHFV in people in Tanzania.

Sincerely,

Dr. Justine Alphonce Assenga
For Director of Veterinary Services

Tanzania Wildlife Research Institute

Head Office P.O. Box 661, Arusha, Tanzania
Tel.: +255 (0) 27 254 9571 / 254 8240; Fax + 255 (0) 27 254 8240
E-mail: info@tawiri.or.tz
Website: www.tawiri.or.tz

Our Ref: TWRI/RG/22/VOL.63/88/12

Your Ref:

Date: 10th January, 2019

Dr. Melinda K. Rostal
EcoHealth Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

RE: LETTER OF SUPPORT FOR A PROPOJECT PROPOSAL

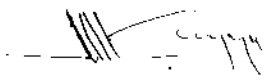
Please refer to the above subject.

The Tanzania Wildlife Research Institute (TAWIRI) is a Parastatal organization under the Ministry of Natural Resources and Tourism (MNRT) with the mandate to conduct, coordinate and oversee wildlife research in Tanzania.

This letter is to support the project proposal titled "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***". I hereby agree to undertake the tasks assigned to me or my organization, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. Crimean Congo hemorrhagic fever (CCHF) illustrates the importance of using a One Health approach to investigate zoonotic pathogens – particularly as animals are the reservoir for CCHF, yet are unaffected themselves by the virus. Therefore it is important to engage veterinary and conservation scientists to understand the ecology and epidemiology of an important public health threat. I believe this project will strengthen the One Health ties between TAWIRI, Tanzania Veterinary Laboratory Agency (TVLA) and Kilimanjaro Clinical research Institute (KCRI), and support the aims of the One Health Coordination Desk at the Prime Minister's Office in Tanzania.

I am looking forward to a fruitful collaboration and implementation of the project.

Yours sincerely,



Dr. Julius D. Keyyu
DIRECTOR OF RESEARCH-TAWIRI
Email: julius.keyyu@tawiri.or.tz
Cell: +255 754 892020

March 1, 2019

Dr. Melinda K. Rostal
EcoHealth Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

I am writing this letter in support of the "***Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. As co-PI of the proposed project, I agree to undertake the tasks assigned to me or my organizations, as described in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. Global Animal Health Tanzania (GAHT) was established to facilitate zoonotic disease research, such as the proposed project. GAHT has experience in coordinating project activities and logistics, has worked with many other Tanzanian institutions and has an office conveniently located in Arusha. I support the scientific, capacity building and relationship-building aspects of the proposed project and believe that it will contribute to reducing the risk of Crimean-Congo hemorrhagic fever in Tanzania.

Sincerely,

Dr. Felix Lankester

Global Animal Health Tanzania
E: lankesterf@vetmed.wsu.edu

Public Health England

National Infection Service /
Research: Virology & Pathogenesis Group
WHO CC Porton Down,
Salisbury, SP4 0JG, UK

T +44 (0)1980 612 390

www.gov.uk/phe

World Health Organization
Collaborating Centre for Virus Research & Reference (Arboviruses & VHFs)
Porton Down 1978

Dr. Melinda K. Rostal

EcoHealth Alliance

460 W 34th St

FL 17

New York, NY 10001

March 14, 2019

Dear Dr. Rostal,

I am writing this letter in support of the "Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania" proposal. I agree to undertake the tasks assigned to our group in the project narrative of the proposal, and I commit to provide or make available the resources specified therein. I have a keen interest in CCHF and support the transfer of any low containment diagnostic assays that may be used in Tanzania. While the main focus of our work in this project will be at BSL4 and therefore not easily transferable, other aspects of our work can be carried out at low containment and may be reproduced in BSL-2 laboratories. I look forward to expanding collaboration to our Tanzanian colleagues. I believe this project will not only provide critical laboratory capacity in Tanzania, but it will also answer critical epidemiological questions regarding the epidemiology of CCHF in a region where it has not previously been studied.

Professor Roger Hewson
Scientific Leader: Arboviruses & Viral Haemorrhagic Fevers
Head: WHO Collaborating Centre for Virus Reference and Research (Special Pathogens)

UNITED REPUBLIC OF TANZANIA
PRESIDENT OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

Telegrams: **"REGCOM"**
Telephone:**2545608/2502289/2545870**
Fax No. **2545239**
E-Mail: rasarusha@yahoo.com
E-Mail: ras.arusha@pmoralg.go.tz
Website: www.arusha.go.tz
In reply please quote:

REGIONAL COMMSSIONER'S OFFICE,
P.O. Box 3050,
ARUSHA.

Ref. No. **RMO/DC.18/110/01A/136** **25/01/2019**

Dr. Melinda K. Rostal
EcoHealth Alliance
460 W 34th St
FL 17
New York, NY 10001

Dear Dr. Rostal,

I am writing this letter in support of the "***Crimean Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania***" proposal. Given that there have been several cases of CCHF in Uganda recently and that the tick vector is present here in Tanzania, I believe it is very important to conduct the fundamental research proposed in this study. These baseline data, in addition to the laboratory diagnostic training and the transfer of the CCHFV serological reagents to the regional health laboratory, will strengthen our ability to diagnose CCHF. The potential for human-to-human transmission in health care facilities highlights the importance of accurately identifying the virus in infected patients to ensure sufficient protective measures are taken by our staff.

Sincerely,

Dr. Wedson A. Sichalwe
For. REGIONAL ADMINISTRATIVE SECRETARY
ARUSHA

March 19th, 2019

Title: ***Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania***

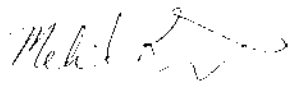
Funding Opportunity: HDTRA1-14-24-FRCWMD-BAA
To whom it may concern:

We request that this phase II application be assigned to be reviewed by the following:
Defense Threat Reduction Agency, Biological Threat Reduction Program Thrust Area 6—Cooperative Counter WMD Research with Global Partners

This program has established a One Health team of Tanzanian and international partners and proposes to determine and assess the risk of Crimean-Congo hemorrhagic fever virus (CCHFV) infection to people across different levels of environmental disturbance. The program also proposes to determine the CCHFV seroprevalence in people, cattle and wildlife as well as investigate the abundance of the vector ticks and environmental correlates associated with higher abundance and seropositivity. This program also proposes to establish CCHFV diagnostics at regional public and animal health laboratories, develop policy recommendations and establish relationships among East African scientists working on CCHF and with international experts on CCHF, thereby reducing the risk of a CCHF outbreak in Tanzania.

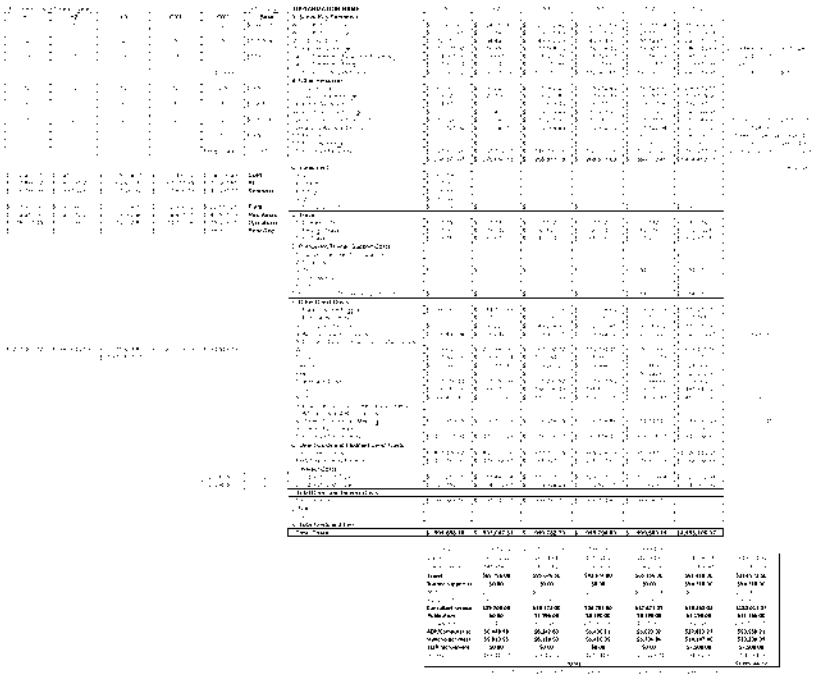
We thank you for your consideration of our request.

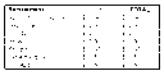
Sincerely,

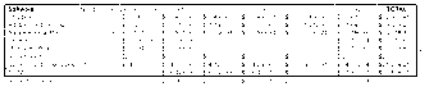


Melinda Rostal DVM, MPH
Senior Research Scientist
EcoHealth Alliance 401(c)
New York

EcoHealth Alliance
460 West 34th Street, Suite 701
New York, NY 10001-2320
212.380.4460
EcoHealthAlliance.org







International Travel	Base Costs	Y1	Y2	Y3	Y4	Y5	TOTAL
Traveller 1 - Miranda Restall-Brooks (Principal Investigator)							
Ground Transport Expenses	300	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	
Lodging Meals & Incidental Expenses Per Diem	334	$ 3,276.00	$ 3,276.00	$ 3,276.00	$ 3,276.00	$ 3,276.00	
Flight Economy	2000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	
No. Days		7	7	7	7	7	
No. Trips per Year		2	2	2	2	2	
Total		$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 7,476.00	$ 37,380.00
Traveller 2 - Miranda Restall-Brooks (Dar es Salaam) Base							
Ground Transport Expenses	300	200.00	200.00	200.00	200.00	200.00	
Lodging Meals & Incidental Expenses Per Diem	334	3,276	3,276	3,276	3,276	3,276	
Flight Economy	900	900	900	900	900	900	
No. Days		5	5	5	5	5	
No. Trips per Year		2	2	2	2	2	
Total		$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 19,500.00
Traveller 3 - Yonah Kaneshi-Restall Dar es Salaam Base							
Ground Transport Expenses	300	100.00	100.00	100.00	100.00	100.00	
Lodging Meals & Incidental Expenses Per Diem	334	2,191	2,191	2,191	2,191	2,191	
Flight Economy	2000	2,000	2,000	2,000	2,000	2,000	
No. Days		7	7	7	7	7	
No. Trips per Year		1	1	1	1	1	
Total		$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 21,455.00
Traveller 4 - Fred Coote-Lancaster (Dar es Salaam) Base							
Ground Transport Expenses	300	200.00	200.00	100.00	200.00		
Lodging Meals & Incidental Expenses Per Diem	334	$ 3,276.00	$ 3,276.00	$ 1,638.00	$ 3,276.00		
Flight Economy	2000	$ 4,000	$ 4,000	$ 2,000	$ 4,000		
No. Days		7	7	7	7		
No. Trips per Year		2	2	1	2		
Total		$ 7,476.00	$ 7,476.00	$ 3,738.00	$ 7,476.00		$ 26,166.00
Traveller 5 - Fred Coote-Lancaster (Dar es Salaam) Base							
Ground Transport Expenses	300	200.00	200.00	100.00	200.00		
Lodging Meals & Incidental Expenses Per Diem	334	$ 3,276	$ 3,276	$ 1,638	$ 3,276		
Flight Economy	900	900	900	900	900		
No. Days		5	5	5	5		
No. Trips per Year		2	2	1	2		
Total		$ 3,952.00	$ 3,952.00	$ 1,976.00	$ 3,952.00		$ 13,832.00
Traveller 6 - Miranda Restall-Brooks (Dar es Salaam) Base							
Ground Transport Expenses	300	100.00	300.00	$ -	$ -	$ -	
Lodging Meals & Incidental Expenses Per Diem	334	$ 1,638.00	$ 1,638.00	$ -	$ 468.00	$ -	
Flight Economy	2000	$ 2,000	$ 2,000	$ -	$ -	$ -	
No. Days		16	7				
No. Trips per Year		1	1				
Days above Based on Number of Trips and Flight Per Diem		6				2	
Total		$ 3,738.00	$ 3,938.00	$ -	$ -	$ 468.00	$ 11,906.00
Traveller 7 - Miranda Restall-Brooks (Dar es Salaam) Base							
Misc Expenses	300	100.00	300.00				
Lodging Meals & Incidental Expenses Per Diem	334	$ 1,638	$ 1,875	$ -	$ 936	$ 1,252	
Flight Economy	900	900	900				
No. Days		5	5				
No. Trips per Year		1	1				
Days above Based on Number of Trips and Flight Per Diem					3	4	
Total		$ 2,278.00	$ 2,278.00		$ 936.00	$ 1,252.00	$ 6,747.00
Traveller 7 - Yonah Kaneshi-Restall Dar es Salaam Base							
Ground Transport Expenses	300			$ -	$ 100.00	$ 100.00	
Lodging Meals & Incidental Expenses Per Diem	334	$	$	$ -	$ 2,191	$ 2,191	
Flight Economy	2000	$	$	$ -	$ 2,000	$ 2,000	
No. Days					7	7	
No. Trips per Year					1	1	
Days above Based on Number of Trips and Flight Per Diem							
Total		$	$	$ -	$ 4,291.00	$ 4,291.00	$ 8,582.00
Traveller 8 - Fred Coote-Lancaster (Dar es Salaam) Base							
Ground Transport Expenses	300	200.00	300.00	$ -	$ 100.00	$ -	
Lodging Meals & Incidental Expenses Per Diem	334	$ 16,380	$ 11,934	$ -	$ 6,552	$ -	
Flight Economy	2000	$ 4,000	$ 4,000	$ -	$ 2,000	$ -	
No. Days		21	17	7	21		
No. Trips per Year		2	2	1	1		
Days above Based on Number of Trips and Flight Per Diem		28	40	0	7		
Total		$ 20,580.00	$ 26,396.00	$ -	$ 8,652.00		$ 55,428.00
Traveller 9 - Fred Coote-Lancaster (Dar es Salaam) Base							
Ground Transport Expenses	300	200.00	300.00	$ -	$ 100.00	$ -	
Lodging Meals & Incidental Expenses Per Diem	334	$ 1,365	$ 1,365	$ -	$ 1,365	$ -	
Flight Economy	900	$ 900	$ 900	$ -	$ 900	$ -	
No. Days		5	4		5		
No. Trips per Year		1	1		1		
Total		$ 1,965.00	$ 1,965.00		$ 1,965.00	$ -	$ 5,895.00
Traveller 10 - Research Assistant (Dar es Salaam)							
Ground Transport Expenses	300		$ -			$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	334		$ -			$ 2,191	
Flight Economy	2,000		$ -			$ 2,000	
No. Days						7	
No. Trips per Year						1	
Total			$ -			$ 4,291.00	$ 4,291.00
Traveller 11 - Carlos Zambrano Tyrone (Brazil)							
Ground Transport Expenses	300		$ 300.00	$ -	$ -		
Lodging Meals & Incidental Expenses Per Diem	334		$ 1,638.00	$ -	$ -		
Flight Economy	2000		$ 2,000.00	$ -	$ -		
No. Days			7				
No. Trips per Year			1				
Total			$ 3,938.00				$ 3,938.00
Traveller 12 - International Co-Investigator, International Co-Investigator Epidemiologist, Collaborators & Partners							
Ground Transport Expenses	300		$ 300.00	$ 300.00	$ 300.00	$ 300.00	
Registration	934		$ 934.00	$ 934.00	$ 934.00	$ 934.00	
Lodging Meals & Incidental Expenses Per Diem	334		$ 1,364	$ 1,365	$ 1,365	$ 1,365	
Flight Economy	2500		$ 2,500	$ 2,500	$ 2,500	$ 2,500	
No. Days			6	6	6	6	
No. Trips per Year			1	1	1	1	
Total			$ 5,098.00	$ 10,603.00	$ 10,603.00	$ 10,603.00	$ 36,903.00
Traveller 13 - Post Doc							
Ground Transport Expenses	300					$ 300.00	
Lodging Meals & Incidental Expenses Per Diem	334					$ 4,382	
Flight Economy	2,000					$ 2,000.00	
No. Days						7	
No. Trips per Year						2	
Total						$ 8,582.00	$ 8,582.00
Research Permit		$ 8,800.00	$ 8,800.00	$ 4,694.00	$ 4,796.00	$ 4,928.00	$ 32,288.00
YEARLY TOTALS		$ 67,006.00	$ 78,144.50	$ 36,542.00	$ 58,224.00	$ 56,278.00	$ 294,594.50
Amount of Research Permit Expected Each Year		$ 4,400.00	$ 4,400.00	$ 2,347.00	$ 4,796.00	$ 4,928.00	

Individual totals	Y1	Y2	Y3	Y4	Y5	Annual Base
Restall	$ 30,467.00	$ 37,732.00	$ 11,436.00	$ 13,945.00	$ 13,126.00	$ 13,406.00
Ramesh	$ 4,291.00	$ 4,291.00	$ 4,291.00	$ 8,582.00	$ 8,582.00	$ 4,291.00
Field Coordinator	$ 13,990.00	$ 21,240.00	$ 5,270.00	$ 22,253.00	$ -	$ 12,406.00
Research assistant	$ -	$ -	$ -	$ -	$ 4,291.00	
Zambrano	$ -	$ -	$ -	$ -	$ 4,291.00	
Y2 post doc	$ -	$ -	$ -	$ -	$ 8,582.00	
Permit	$ 4,400.00	$ 8,800.00	$ 4,694.00	$ 4,796.00	$ 4,928.00	$ 4,800.00
International Co-Investigator	$ -	$ 5,098.00	$ 10,603.00	$ 10,603.00	$ 10,603.00	
Total	$ 52,838.00	$ 77,164.50	$ 36,542.00	$ 58,224.00	$ 56,278.00	$ 43,403.00

Domestic Travel	Y1	Y2	Y3	Y4	Y5	
Traveller 1 - ITHD Internal Meeting						
Ground Transportation	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Lodging Meals & Incidental Expenses Per Diem	$ 1,250.00	$ 1,250.00	$ 1,250.00	$ 1,250.00	$ 1,250.00	
Flight/Train Estimate	$ 400	$ 400	$ 400	$ 400	$ 400	
No. Days	3	3	3	3	3	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,350.00	$ 1,750.00	$ 1,750.00	$ 1,750.00	$ 1,750.00	$ 8,750.00
Traveller 2 - Research Conference - e.g. APHA						
Ground Transportation	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	
Lodging Meals & Incidental Expenses Per Diem	$ 2,450.00	$ 2,450.00	$ 2,450.00	$ 2,450.00	$ 2,450.00	
Flight/Train Estimate	$ 1,100	$ 1,100	$ 1,100	$ 1,100	$ 1,100	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 3,900.00	$ 19,500.00
Conference Registration Fees	$ 1,542.00	$ 1,542.00	$ 1,542.00	$ 1,542.00	$ 1,542.00	$ 7,710.00
YEARLY TOTALS	$ 7,192.00	$ 7,192.00	$ 7,192.00	$ 7,192.00	$ 7,192.00	

	Participant Support Costs	TOTAL
Traveller 1 - ITHD Lead Applicant Base		
Ground Transportation		
Lodging Meals & Incidental Expenses Per Diem	$ 26,500.00	
Flight/Train Estimate	$ 9,000	
No. Days	7	
No. Participants	50	
Total	$ 80,500.00	$ 80,000.00
Traveller 2 - Director of Africa Sampson Hall		
Ground Transportation		
Lodging Meals & Incidental Expenses Per Diem	$ 20,000.00	
Flight/Train Estimate	$ 14,000	
No. Days	7	
No. Participants	50	
Total	$ 34,000.00	$ 34,710.00
YEARLY TOTALS	$ 58,730.00	

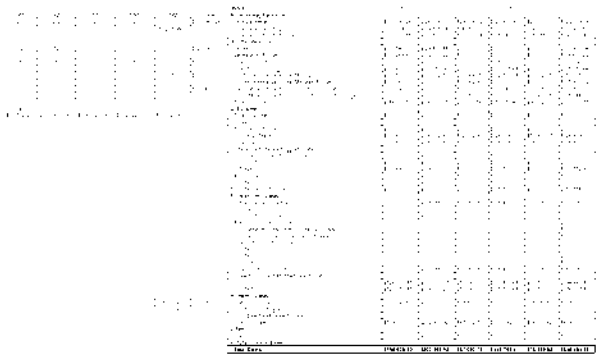
Item	Number in Unit	Price per unit	Number needed Y1	Number need Y1		Y2		Y3	Y4	Y5			
Shipping Dosa	1	$ 5,011.00	3	1	$ 15,033.00	$ 15,483.99			$ 5,475.65		$ 35,992.64	0.0%	4995109.37
Label Printer Supplies (5000 roll)	**1**	**$ 133.45**	**3**	**2**	**$ 400.35**	**$ 412.36**			**$ 291.65**				
Label printer ribbon (for 14,000 labels)	**1**	**$ 28.89**	**1**	**2**	**$ 28.89**	**$ 29.75**			**$ 63.14**				
Theory Computers	**1**	**$ 2,126.00**	**2**	**1**	**$ 4,252.00**	**$ 2,126.00**			**$ 2,126.00**	**$ 2,126.00**	$ 3,795.54	$ 442.12	$ - $ 354.49
Software Arc GIS	**1**	**$ 1,000.00**		**1**	$ -					**$ 2,750.00**	$ 2,750.00		
Supplies for Graduate Students/Postdoc	1	$ 1,500.00	1	2	$ 1,500.00	$ 1,545.00	$ 3,182.70		$ 3,278.18	$ 3,376.53			
Label printer (Brady 300 dpi)	1	$ 3,366.10	1		$ 3,366.10								
Refrigerator	1	$ 2,740.00	1		$ 2,740.00								
Refrigerator Thermometer	1	$ 101.00	1		$ 101.00								
Multiscan ex plate reader Lamp	1	$ 174.10	1		$ 174.10								
Sterl al microscope	1	$ 3,347.30	1		$ 3,347.30								
Water Distiller	1	$ 2,458.50	1		$ 2,458.50								
pH Meter	1	$ 257.92	1		$ 257.92								
ELISA Washer	1	$ 2,513.48	1		$ 2,513.48								
Fridge for vel Les	1	$ 3,795.50	2		$ 7,590.00								
Backup battery for fr dge	1	$ 1,495.00	2		$ 2,990.00								
Nunc 1.8 internal cryovials	1800	$ 967.79	3	3	$ 2,903.19	$ 2,990.29			$ 3,179.39				
Serum tubes 10 ml	1000	$ 331.66	3	3	$ 994.98	$ 1,024.83			$ 1,089.24				
Serum tubes 3 ml	1000	$ 261.67	2	1	$ 523.34	$ 269.47							
Serum 1.3m or smaller?	100	$ 36.50	5		$ 182.50	$ 187.98							
Vaccutainer holder	1000	$ 91.90	3	2	$ 275.70	$ 283.97			$ 903.79				
21g 1in vaccutainer safety needles	480	$ 333.50	2	3	$ 679.00	$ 699.37			$ 1,110.94				
3cc luer lock syringe	1000	$ 196.73	2		$ 393.46	$ 202.63							
22g 1in needle (for vaccutainer)	1000	$ 270.89	1		$ 270.89	$ 279.02							
22g 1in needle (for syringe)	1000	$ 218.36	2		$ 436.72	$ 224.91							
1cc syringe and needle	1000	$ 213.21	1		$ 213.21	$ 219.61							
Thumb forceps to collect ticks	1	$ 9.00	2		$ 18.00	$ 18.54							
Tubes to put ticks in	500	$ 415.00	3		$ 1,245.00	$ 1,282.35							
PPE protective covera for rodent work (M)	24	$ 470.00	11		$ 5,170.00	$ 5,325.10							
PPE protective covera for rodent work (L)	24	$ 470.00	11	12	$ 5,170.00	$ 5,800.20							
N95 respirator for rodent work	80	$ 314.00	7		$ 2,198.00	$ 2,263.94							
Resp rator fit test kit	1	$ 486.00	1		$ 486.00								
Safety glasses	10	$ 32.30	10		$ 323.00								
Nitrile gloves extended cuff XL	500	$ 332.50	2	1	$ 665.00	$ 684.95			$ 363.33				
Nitrile gloves extended cuff M	500	$ 332.50	3	1	$ 997.50	$ 1,027.43			$ 363.33				
Nitrile gloves extended cuff S	500	$ 332.50	1	2	$ 332.50	$ 342.48			$ 726.66				
2 gallon sharps bucket	20	$ 238.33	1	1	$ 238.33	$ 245.48			$ 260.43				
6 cy hazard bags	50	$ 38.13	1	1	$ 38.13	$ 39.27			$ 41.67				
Tablets (alcohol)	1	$ 228.58	8	2	$ 1,831.84	$ 1,886.80			$ 500.43				
50 Tomahawk traps	1	$ 63.45	50	10	$ 1,172.50	$ 653.54			$ 693.34				
30 squirrel traps	1	$ 44.82	30	10	$ 1,344.60	$ 461.65							
20 rodent traps	1	$ 27.99	99	10	$ 670.79	$ 380.47							
Incentive for cattle owners	1	$ 7.00	600		$ 4,200.00	$ 4,326.00							
Incentive: cookies/juice for parade/fairs	1	$ 2.00	400	800	$ 800.00	$ 824.00			$ 1,748.36				
Ear tags/tagger kit		$ 398.00			$ 398.00								
Anesthesia for small mammals		$ 6,836.97			$ 3,168.48	$ 3,263.53							
Ethanol gallon	1	$ 82.00	1		$ 82.00								
SubTotal					$ 86,080.70	$ 54,713.88	$ 4,701.89		$ 22,208.54	$ 8,252.53			

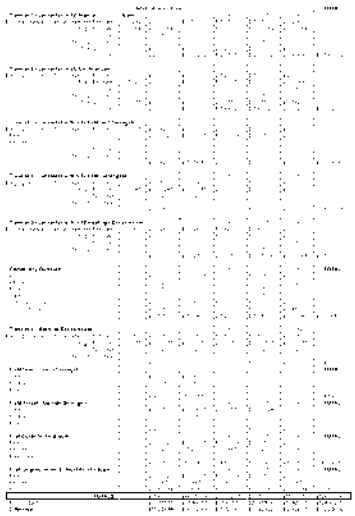
Lab supplies for workshop				Y1	Y2	Y3	OY1	OY2	TOTAL
Eppendorf tubes	$ 93.00	3				$ 279.00			$ 279.00
ELISA plates	$ 138.40	2				$ 276.80			$ 276.80
Filter pipette 1 to 200uL	$ 191.70	1				$ 191.70			$ 191.70
Filter pipette 1 to 1000uL	$ 227.00	1				$ 227.00			$ 227.00
P pette tips 1000uL	$ 126.10	1				$ 126.10			$ 126.10
P pette tips 200uL	$ 79.00	2				$ 158.00			
P pette tips 1000uL	$ 76.00	2				$ 152.00			$ 152.00
Shipping and handling						$ 105.59			
SubTotal				$ -	$ -	$ 1,515.9	$ -	$ -	$ 1,515

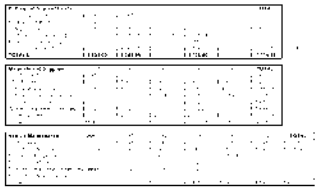
OVERALL

Breakdown for Justification	Y1	Y2	Y3	OY1	OY2
Field supplies	$ 39,328.00	$ 35,110.77	$	$ 10,973.62	$
Shipping	$ 15,033.00	$ 15,483.99	$	$ 5,475.65	$
Computers	**$ 8,047.34**	**$ 2,568.12**	**$ -**	**$ 2,480.79**	**$ 4,876.00**
Lab infrastructure/large items	$ 20,172.30	$	$	$	$
Supplies for Grad students	$ 1,500.00	$ 1,545.00	$ 3,182.70	$ 3,278.18	$ 3,376.53
Total	$ 86,080.70	$ 54,713.88	$ 4,701.89	$ 22,208.54	$ 8,252.53

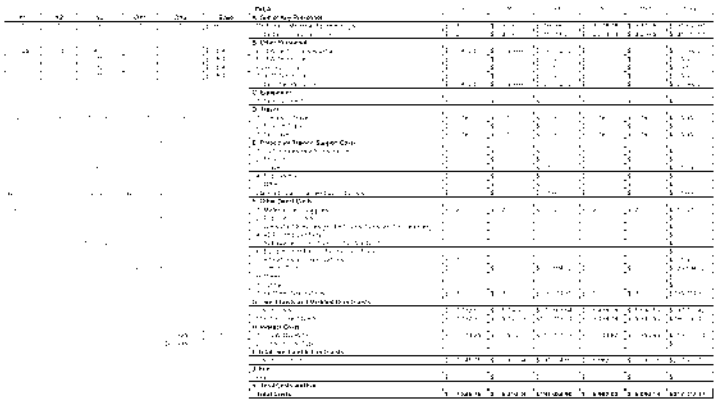
Field supply breakdown	Y1	Y2	Y3	OY1	OY2
Sampling supplies	$ 8,217.80	$ 7,682.06	$ -	$ 5,276.37	$ -
PPE	$ 15,538.46	$ 15,737.84	$ -	$ 1,755.42	$ -
Incentive	$ 5,000.00	$ 5,150.00	$ -	$ 1,748.36	$ -
Tablets	$ 1,831.84	$ 1,886.80	$ -	$ 500.43	$ -
Tracking and	$ 8,709.87	$ 4,659.18	$ -	$ 693.14	$ -
Total	$ 39,328.00	$ 35,110.77	$	$ 10,973.62	$

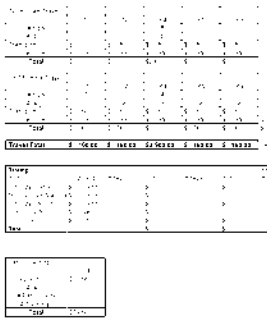






Visa and Permit	Y1	Y2	Y3	Y4	Y5			
COSTech application fee	50	50	50	50	50			
COSTech clearance fee	300	300	300	300	300			
Research fees (non-Tanzanian)	1800	1800	1800	1800	1800	9000		
TAWIRI Protected Area Permit	2000	2000				4000		
Shipping samples			300	300	300	900		
KCMC ethics approval	500					500		
NIMR - submit protocol	500					500		
NIMR - application fee	100					100		
NIMR - Expedited Review	1000					1000		
NIMR - Renewal		100	100	100	100	400		
NIMR - amendment	600	300		300		1200		
Hummingbird IRB	2000	2000	2000	2000	2000	10000	27600	
Cost per Person	Y1	Y2	Y3	Y4	Y5			
Rostal EHA	4150	4150	2150	2150	2150	14750		
Field Coordinator EHA	4150	4150	2150	2150	2150	14750		
Cleaveland UoG	0	2150	2150	2150	2150	8600		$ 89,750.00
Technician UoG	2150	2150	2150	2150		8600		
Lankester SU	4150	4150	2150	2150	2150	14750		
Veterinarian WSU	50	50	0	0	0	100		
Field Assistant WSU	50	50	0	50	0	150		
PhD Student WSU	50	50	0	0	0	100		
Masters' students EHA	0	50	100	100	50	300		
Post-doctoral fellow	0	0	0	0	50	50	62150	





Y1	Y2	Y3	QY1	QY2	Base
1	1	1	1	1	$ 70,000.00
12	12	12	3	3	$ 3,500.00

TAMRI	Y1	Y2	Y3	QY1	QY2	Total
A. Senior/Key Personnel						
Dr. Julie Bell, Key..., Disease Modeling at	$ 2,300.00	$ 2,376.00	$ 2,062.25	$ 2,731.12	$ 2,813.77	$ 12,272.54
Total Senior Key Personnel	$ 2,300.00	$ 2,376.00	$ 2,062.25	$ 2,731.12	$ 2,813.77	$ 12,272.54
B. Other Personnel						
Wildlife Technician (960day x 65 days)	$ 1,600.00	$ 1,600.00	$ -	$ -	$ -	$ 7,200.00
Total Other Personnel	$ 1,600.00	$ 1,600.00	$ -	$ -	$ -	$ 7,200.00
C. Equipment						
Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
D. Travel						
1. Domestic Travel	$ 300.00	$ 309.00	$ 318.00	$ 327.00	$ 336.00	$ 1,590.00
2. Foreign Travel	$ -	$ -	$ -	$ -	$ -	$ -
Total Travel	$ 300.00	$ 309.00	$ 318.00	$ 327.00	$ 336.00	$ 1,590.00
E. Participant/Trainee Support Costs						
1. Tuition Fees (health insurance)	$ -	$ -	$ -	$ -	$ -	$ -
2. Stipends	$ -	$ -	$ -	$ -	$ -	$ -
3. Travel	$ -	$ -	$ -	$ -	$ -	$ -
4. Subsistence	$ -	$ -	$ -	$ -	$ -	$ -
5. Other	$ -	$ -	$ -	$ -	$ -	$ -
Total Participant Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies						$ -
2. Publication Costs						$ -
3. Consultant Services (Round Trip Airfare, Per Diem, etc.)						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$ -
6. Equipment or Facility Rental/Lease Fees						$ -
7. Alterations and Renovations						$ -
8. Other						$ -
9. Other						$ -
10. Other						$ -
Total Other Direct Costs	$ -	$ -	$ -	$ -	$ -	$ -
G. Direct Costs are Modified Direct Costs						
Direct Costs	$ 6,400.00	$ 6,484.00	$ 5,473.25	$ 3,058.12	$ 3,149.77	$ 22,302.54
Modified Direct Costs	$ 6,400.00	$ 6,484.00	$ 5,473.25	$ 3,058.12	$ 3,149.77	$ 22,302.54
H. Indirect Costs						
1. TAMRI ICC Rate	$ 640.00	$ 648.40	$ 267.03	$ 306.88	$ 314.98	$ 2,299.28
2. Federal Cost Type						$ -
I. Total Direct and Indirect Costs						
Direct + Indirect	$ 7,040.00	$ 7,132.40	$ 5,267.28	$ 3,364.70	$ 3,464.75	$ 24,269.12
J. Fee						
Fee	$ -	$ -	$ -	$ -	$ -	$ -
K. Total Costs and Fee						
Total Costs	$ 7,040.00	$ 7,132.40	$ 5,267.28	$ 3,364.70	$ 3,464.75	$ 24,269.12

ICC Rate-> 10%
ICC Rate->

Travel					
	Y1	Y2	Y3	Y4	Y5
Trips	2	2	2	2	2
People	2	2	2	2	2
Transport	$ 50.00	$ 40.00	$ 40.00	$ 40.00	$ 50.00
Per Diem	$ 55.00	$ 65.00	$ 38.00	$ 55.00	$ 55.00
Total	$ 330.00	$ 309.00	$ 318.00	$ 327.00	$ 336.00

Value
$ 6.0% X $ 6,175 X $ 2,062.25 $ 2,731.12 $ 2,813.77

Y1	Y2	Y3	OY1	OY2	Base
0.17	0.17	0.17	2	2	$ 17,568.00
0.4	0.4	0.4	4.4	4.4	$ 7,734.00

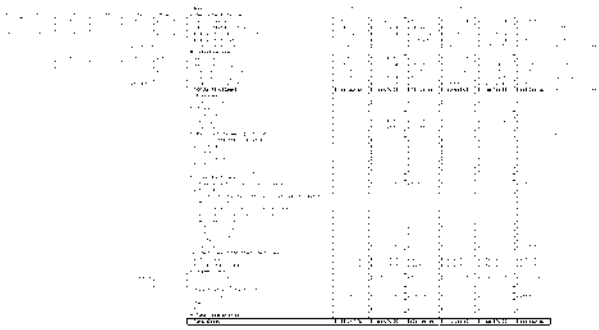
One Health Desk	Y1	Y2	Y3	OY1	OY2	Total
A. Senior/Key Personnel						
Dr. Justine Assanga, Molecular Epidemiologist	$ 248.03	$ 255.47	$ 263.14	$ 3,188.58	$ 3,284.23	$ 7,239.45
Dr. Justine Belnaic, Public Health Specialist	$ 267.82	$ 255.55	$ 273.52	$ 3,630.00	$ 3,191.97	$ 7,067.86
Total Senior/Key Personnel	$ 525.85	$ 521.03	$ 536.66	$ 6,267.57	$ 6,476.20	$ 14,307.30
B. Other Personnel						
Total Other Personnel	$ -	$ -	$ -	$ -	$ -	$ -
C. Equipment						
Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -
D. Travel						
1. Domestic Travel	$ 600.00	$ 618.00	$ 636.54	$ 655.64	$ 675.31	$ 3,185.47
2. Foreign Travel	$ -	$ -	$ -	$ -	$ -	$ 153,974.74
Total Travel	$ 600.00	$ 618.00	$ 636.54	$ 655.64	$ 675.31	$ 3,185.47
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$ -
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$ -
5. Other						$ -
Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies						$ -
2. Publication Costs						$ -
3. Consultant Services (Recent Q1 Inquiry 2b: Site Team Mi						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$ -
6. Equipment or Facility Rental/User Fees						$ -
7. Alterations and Renovations						$ -
8. Other (Journals: $2,500/yr x 3 + $50 in Y1-3)						$ -
9. Other (Social Media)						$ -
10. Other (Equipment Maintenance)						$ -
Total Other Direct Costs	$ -	$ -	$ -	$ -	$ -	$ -
G. Direct Costs are Modified Direct Costs						
Direct Costs	$ 1,125.85	$ 1,139.03	$ 1,173.20	$ 6,923.21	$ 7,151.51	$ 17,512.79
Modified Direct Costs	$ 1,125.85	$ 1,139.03	$ 1,173.20	$ 6,923.21	$ 7,151.51	$ 17,512.79
H. Indirect Costs						
1. DHDE IDC Rate	$ 110.59	$ 113.90	$ 117.32	$ 694.32	$ 715.15	$ 1,751.28
IDC Rate → 10%						
2. Federal Cost Type						$ -
I. Total Direct and Indirect Costs						
Direct + Indirect	$ 1,216.44	$ 1,252.93	$ 1,290.52	$ 7,617.53	$ 7,866.66	$ 19,264.07
J. Fee						
Fee	$ -	$ -	$ -	$ -	$ -	$ -
K. Total Costs and Fee						
Total Costs	$ 1,216.44	$ 1,252.93	$ 1,290.52	$ 7,617.53	$ 7,866.66	$ 19,264.07

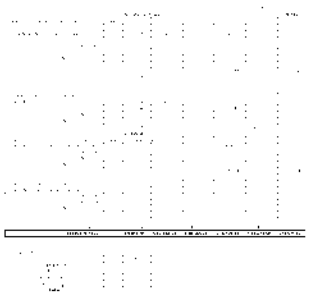
Travel	Y1	Y2	Y3	Y4	Y5
# Trips	4	4	4	4	4
# People	2	2	2	2	2
Transport	$ 450.00	$ 463.50	$ 477.41	$ 491.73	$ 506.48
Per Diem	$ 150.00	$ 154.50	$ 159.14	$ 163.91	$ 168.83
Total	$ 600.00	$ 618.00	$ 636.54	$ 655.64	$ 675.31

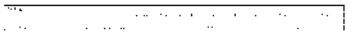
Y1	Y2	Y3	OY1	OY2	Base	PHL	Y1	Y2	Y3	OY1	OY2	Total	
0	0	0	0	0.1	$ 121,957.00	Dr Roger Iverson, Principal	$ -	$ -	$ -	$ -	$ 1,129.17	$ 1,129.17	
						Total Senior Key Personnel	$ -	$ -	$ -	$ -	$ 1,129.17	$ 1,129.17	
						B. Other Personnel						$ -	
0	0	0	0	0.075	$ 87,144.00	Dr. Stuart Duval, Volcanologist	$ -	$ -	$ -	$ -	$ 6,794.42	$ 6,794.42	
0	0	0	0	0.05	$ 85,231.00	Neil Wallace, Project Manager	$ -	$ -	$ -	$ -	$ 555.25	$ 555.25	
0	0	0	0	1.2	$ 72,322.00	Kevin Richards, Technician	$ -	$ -	$ -	$ -	$ 7,215.20	$ 7,215.20	
0	0	0	0	1.2	$ 38,881.00	James Allman, Technician	$ -	$ -	$ -	$ -	$ 6,666.10	$ 6,666.10	
						Total Other Personnel	$ -	$ -	$ -	$ -	$ 24,260.07	$ 24,260.07	$ 25,405.24
						C. Equipment							
						Total Equipment	$ -	$ -	$ -	$ -	$ -	$ -	
						D. Travel							
						1. Domestic Travel						$ -	
						2. Foreign Travel					$ 1,950.00	$ 1,950.00	
						Total Travel	$ -	$ -	$ -	$ -	$ 1,950.00	$ 1,950.00	
						E. Participant/Trainee Support Costs							
						1. Tuition/Fees/Health Insurance	$ -	$ -	$ -	$ -	$ -	$ -	
						2. Stipends	$ -	$ -	$ -	$ -	$ -	$ -	
						3. Travel	$ -	$ -	$ -	$ -	$ -	$ -	
						4. Subsistence	$ -	$ -	$ -	$ -	$ -	$ -	
						5. Other	$ -	$ -	$ -	$ -	$ -	$ -	
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -	
						F. Other Direct Costs							
						1. Materials And Supplies						$ -	
						2. Publication Costs						$ -	
						3. Consultant Services (Records Check and Field Team)						$ -	
						4. ADP/Computer Services						$ -	
						5. Subawards/Consortia/Contractual Costs						$ -	
						6. Equipment Or Facility Rental/User Fees					$ 7,326.00	$ 7,326.00	
						7. Alterations and Renovations						$ -	
						8. Other (Tech Vol)					$ 4,630.00	$ 4,630.00	
						9. Other (shipping samples)					$ 1,251.00	$ 1,251.00	
						10. Other (Tablet for 4 years)					$ 617.00	$ 617.00	
						Total Other Direct Costs	$ -	$ -	$ -	$ -	$ 14,124.00	$ 14,124.00	
						G. Direct Costs and Modified Direct Costs							
						Direct Costs	$ -	$ -	$ -	$ -	$ 41,833.15	$ 41,833.15	
						Modified Direct Costs						$ -	
						H. Indirect Costs							
			IDC Rate >	37.5%		1. PHL IDC Rate	$ -	$ -	$ -	$ -	$ 15,399.53	$ 15,399.53	
			IDC Rate>			2. Indirect Cost Type						$ -	
						I. Total Direct and Indirect Costs							
						Direct + Indirect	$ -	$ -	$ -	$ -	$ 57,232.68	$ 57,232.68	
						J. Fee							
						Fee	$ -	$ -	$ -	$ -	$ -	$ -	
						K. Total Costs and Fee							
						Total Costs	$ -	$ -	$ -	$ -	$ 57,232.68	$ 57,232.68	

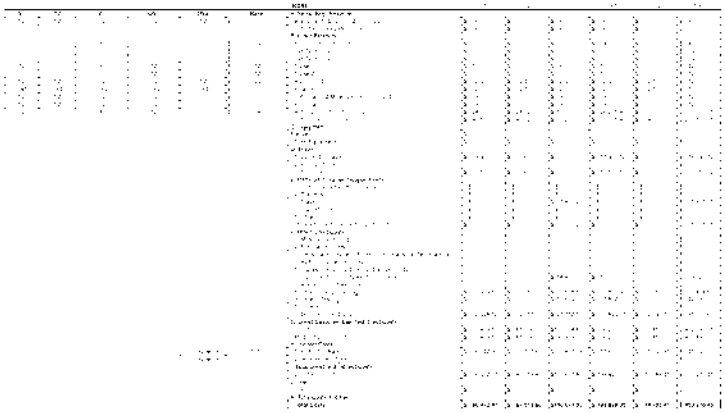
Travel			
Field	$ 1,300.00	1,300.00	$ 1,300.00
International	$ 650.00	1	$ 650.00
Total			$ 2,300.00

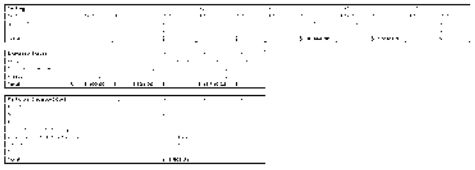
Materials and Supplies			
Cell Tower	$ 40.00	100	$ 4,000.00
Instruments	$ 1,000.00	2	$ 2,000.00
			$ 32,206.00











From: Aleksei Chmura
To: (b)(6)
Cc: Robinson, Adrea A CIV (USA); Whitney Bagge; Joe Riccardi; Billy Karesh
Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications
Date: Thursday, September 17, 2020 11:38:05 AM
Attachments: DTRA Jordan Budget 28 Aug 2020.xlsx

Dear (b)(6)

Please find our excel file with a breakdown of EcoHealth Alliance costs and with separate tabs for our subcontracts.

Call me anytime, if you have additional questions or need other documents.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 > (office)
(b)(6) < tel:1.646.413.3437 > (mobile)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 14, 2020, at 11:23, (b)(6) (b)(6) > > wrote:

Good morning,

Thank you for documents as they will come in handy. Would you be able to provide an excel breakdown of EHA and subs?

-----Original Message-----
From: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> >
Sent: Wednesday, September 2, 2020 12:34 PM
To: (b)(6)

Y1	Y2	Y3	Y4	Y5	OY2	Base
2	2	2	2	2	$	291,477.26
2	2	2	2	2	$	67,747.18
4	4	4	4	3	$	85,884.88
2	2	2	2	2	$	93,109.09
					Fringe Rate =	36.50%
1	1	1	1	1	$	59,727.47
12	12	12	12	12	$	81,013.16
					Fringe Rate =	36.50%

PRIME Budget	Y1	Y2	Y3	OY2	Total
A. Senior Key Personnel					
Arthur, Kenneth, PI	$ 46,506.23	$ 48,181.85	$ 53,810.46	$ 56,765.86	$ 205,264.40
Arthur, Kenneth, Fringe	$ 17,854.85	$ 18,758.30	$ 20,661.28	$ 21,794.79	$ 78,969.22
Early, Megan, Behavioral Risk Scientist	$ 16,806.80	$ 17,733.84	$ 18,712.14	$ 19,745.18	$ 72,997.96
Early, Megan, Fringe	$ 6,232.74	$ 6,544.38	$ 6,871.60	$ 7,215.18	$ 26,863.84
Collins, Ward, Abdul, Co-Principal Inv	$ 28,928.29	$ 30,029.71	$ 31,362.96	$ 33,140.83	$ 123,461.79
Collins, Ward, Abdul, Fringe	$ 10,563.21	$ 10,961.97	$ 11,615.20	$ 12,096.62	$ 45,136.99
Whitney, Beggie, Modeler	$ 14,050.71	$ 15,007.92	$ 15,821.06	$ 17,412.05	$ 62,291.40
Whitney, Beggie, Fringe	$ 5,356.94	$ 5,544.65	$ 5,822.13	$ 6,113.27	$ 23,175.99
Total Senior Key Personnel	$ 146,056.75	$ 155,779.12	$ 165,547.26	$ 174,725.42	$ 638,253.79
B. Other Personnel					
Omenetto, Emily, Program Coordinator	$ 14,497.05	$ 15,007.47	$ 15,811.41	$ 17,201.70	$ 62,517.64
Omenetto, Emily, Fringe	$ 5,291.95	$ 5,477.73	$ 5,771.17	$ 6,278.62	$ 22,819.46
Research Assistant	$ 53,274.00	$ 54,870.00	$ 56,516.10	$ 58,211.58	$ 222,871.68
RA Fringe	$ 19,447.01	$ 20,030.42	$ 20,631.33	$ 21,250.27	$ 81,358.03
Total Other Personnel	$ 103,853.01	$ 108,385.62	$ 114,830.01	$ 123,268.18	$ 430,366.81
C. Equipment					
Total Equipment	$ -	$ -	$ -	$ -	$ -
D. Travel					
1 Domestic Travel	$ 4,690.69	$ 7,331.69	$ 7,562.50	$ 7,942.69	$ 33,858.69
2 Foreign Travel	$ 31,016.69	$ 31,532.50	$ 32,039.50	$ 32,039.50	$ 134,273.69
Total Travel	$ 35,213.99	$ 38,864.19	$ 39,702.30	$ 39,982.19	$ 168,132.69
E. Participant, Trainee Support Costs					
1 Tuition, Fees, Health Insurance					$ -
2 Stipends					$ -
3 Travel					$ -
4 Subsistence					$ -
5 Other					$ -
Total Participant, Trainee Support Costs	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs					
1 Materials and Supplies	$ 2,346.46	$ 2,417.85	$ 2,317.86	$ 2,317.89	$ 17,415.46
2 Publication Costs	$ -	$ 5,265.00	$ 5,265.00	$ -	$ 10,530.00
3 Consultant Services	$ 1,500.00	$ 500.00	$ 500.00	$ 500.00	$ 3,000.00
4 ADP Computer Services					$ -
5 Subawards, Consortium/Contractual Costs					$ -
UGA	$ 553,234.00	$ 530,319.00	$ 529,647.00	$ 524,524.00	$ 2,577,055.72
Fringe Cost	$ 3,275.17	$ 14,140.97	$ 12,140.97	$ 12,140.97	$ 55,042.05
6 Equipment or Facility Rental, User Fees					$ -
7 Alterations and Renovations					$ -
8 Other					$ -
9 Other					$ -
Total Other Direct Costs	$ 10,346.46	$ 8,017.54	$ 8,017.54	$ 2,817.89	$ 35,945.46
G. Direct Costs, excl Modified Total Direct Costs					
Direct Costs	$ 3,307,287.81	$ 3,513,727.80	$ 3,339,881.36	$ 3,353,665.67	$ 13,514,563.64
Modified Direct Costs					$ -
H. Indirect Costs					
1 Indirect Cost Type	$ 136,336.66	$ 112,439.77	$ 118,869.31	$ 121,797.66	$ 489,383.66
2 Indirect Cost Type	$ 11,995.93	$ 9,029.99	$ 352.38	$ -	$ 12,930.69
I. Total Direct and Indirect Costs					
Direct + Indirect	$ 422,920.69	$ 437,234.69	$ 459,330.23	$ 481,294.20	$ 1,800,780.11
J. Fee					
Fee					
K. Total Costs and Fee					
Total Costs	$ 3,730,208.50	$ 3,951,962.49	$ 3,799,211.59	$ 3,834,959.87	$ 15,315,343.75
Cost Share Terms					
	$ 864,386.84	$ 911,865.65	$ 881,176.15	$ 889,987.39	$ 3,547,416.05

RMS Supplies	Description	Y1	Y2	Y3	OY1	OY2	
Laptop	$ 2,500.00	$ 5,000.00					$ 5,000.00
Desk	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Projector	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 2,400.00
Printer	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 1,749.95
Tablet	$ 349.99	$ 349.99					$ 349.99
Software	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 1,500.00
Computer Mouse	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 250.00
Tablet	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 1,750.00
Hard Drive	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 375.00
TOTALS		$ 6,400.45	$ 1,533.98	$ 1,812.98	$ 2,332.98	$ 1,812.98	$ 13,400.45

Consultant Services	Y1	Y2	Y3	OY1	OY2
Rate	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00
# of Trainings	$ 3,000.00				
TOTAL	$ 3,500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00

Publication Costs	Y1	Y2	Y3	OY1	OY2
Page Charge		$ 5,265.00			
Subscription Rate		$ 5,265.00			
TOTAL	$ -	$ 10,530.00	$ -	$ -	$ -

International Travel						TOTAL
Traveler 1 - William Karesh (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 3,780.00	$ 29,164.00
Traveler 2 - William Karesh (Field)						
Hotel Max Per Diem	$ 584.00	$ 584.00	$ 584.00	$ 584.00	$ 584.00	
Meals and Incidental Expenses Per Diem	$ 472.50	$ 472.50	$ 472.50	$ 472.50	$ 472.50	
Taxi Estimate	$ 285.00	$ 285.00	$ 285.00	$ 285.00	$ 285.00	
Flight Estimate						
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 8,707.50
Traveler 3 - Catherine Machalaba (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$ 2,566	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 31,730.00
Traveler 4 - Catherine Machalaba (Field)						
Hotel Max Per Diem	$ 1,414.00	$ 1,578.30	$ 2,628.00	$ 2,628.30	$ 2,628.00	
Meals and Incidental Expenses Per Diem	$ 997.50	$ 1,395.30	$ 1,995.00	$ 1,995.30	$ 1,995.00	
Taxi Estimate	$ 435.00	$ 870.30	$ 870.00	$ 870.30	$ 870.00	
Flight Estimate						
No. Days	10	10	10	10	10	
No. Trips per Year	1	2	1	2	1	
Total	$ 2,746.50	$ 5,493.30	$ 5,493.00	$ 5,493.30	$ 5,493.00	$ 24,718.90
Traveler 5 - Emily Bogan (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.30	$ 1,968.00	$ 1,968.30	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.30	$ 1,242.00	$ 1,242.30	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 6,415	$ 6,415	$ 6,415	$ 6,415	$ 6,415	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 52,975.00

Traveler 5 - International Conference (IUCN)	Vietnam					
Hotel Max Per Diem	$ 819	$ 819	$ 1,638	$ 1,638	$ 1,638	
Meals and Incidental Expenses Per Diem	$ 480	$ 480	$ 480	$ 480	$ 480	
Taxi Estimate	$ 285.00	$ 285.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 1,493	$ 1,493	$ 2,986	$ 2,986	$ 2,986	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	2	2	2	
Total	$ 2,607.00	$ 2,807.30	$ 5,614.00	$ 5,814.30	$ 5,614.00	$ 22,456.00
Visa Fees	$ 504.00	$ 504.30	$ 504.00	$ 504.30	$ 504.00	$ 2,520.00
Vaccination Costs	$ 850.00					$ 850.00
Conference Registration Fees	$ 500.00	$ 500.30	$ 1,000.00	$ 1,000.30	$ 1,000.00	$ 4,000.00
YEARLY TOTALS	$ 31,016.00	$ 42,542.50	$ 56,869.50	$ 86,849.50	$ 54,473.50	$ 271,101.00
conference			visa			
$ DAILY	520		Jansen	58		

Domestic Travel						TOTAL
Traveler 1 - William Karesh (NY DC)						
Hotel Max Per Diem	$ 512	$ 256	$ 512	$ 512	$ 512	
Meals and Incidental Expenses Per Diem	$ 128	$ 114	$ 128	$ 128	$ 128	
Taxi Estimate	$ 90.00	$ 45.00	$ 90.00	$ 90.00	$ 90.00	
Transportation Estimate	$ 492	$ 156	$ 492	$ 492	$ 492	
No. Days	2	2	2	2	2	
No. Trips per Year	2	1	2	2	2	
Total	$ 1,222.00	$ 614.00	$ 1,222.00	$ 1,222.00	$ 1,222.00	$ 5,499.00
Traveler 2 - Catherine Machalaba (NY DC)						
Hotel Max Per Diem	$ 256	$ 256	$ 256	$ 256	$ 256	
Meals and Incidental Expenses Per Diem	$ 114	$ 114	$ 114	$ 114	$ 114	
Taxi Estimate	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	
Transportation Estimate	$ 196	$ 196	$ 196	$ 196	$ 196	
No. Days	2	2	2	2	2	
No. Trips per Year	1	1	1	1	1	
Total	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 3,055.00
Traveler 3 - Attend no Meeting in VA						
Hotel Max Per Diem	$ 1,024	$ 1,024	$ 1,024	$ 1,024	$ 1,024	
Meals and Incidental Expenses Per Diem	$ 380	$ 380	$ 380	$ 380	$ 380	
Taxi Estimate	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	
Transportation Estimate	$ 1,011	$ 1,011	$ 1,011	$ 1,011	$ 1,011	
No. Days	4	4	4	4	4	
No. Trips per Year	2	2	2	2	2	
Total	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 14,324.00
Traveler 4 - Presenting Domestic Mtg ASTMH (Maryland)						
Hotel Max Per Diem	$	$ 924	$ 924	$ 924	$ 924	
Meals and Incidental Expenses Per Diem	$ -	$ 497	$ 497	$ 497	$ 497	
Taxi Estimate	$ -	$ 210.00	$ 210.00	$ 210.00	$ 210.00	
Transportation Estimate	$ -	$ 684	$ 684	$ 684	$ 684	
No. Days	3	4	4	4	4	
Prep + Attending	3	2	2	2	2	
Total	$ -	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 9,260.00

Conference Registration Fees	$ -	$ 930.00	$ 930.00	$ 930.00	$ 930.00	
YEARLY TOTALS	$ 4,697.80	$ 7,421.80	$ 7,942.80	$ 7,942.80	$ 7,942.80	$ 35,168.00
/month	$ 469.78					

Y1	Y2	Y3	OY1	OY2	Base
7.5	7.5	7.5	0.5	0.5	$ [illegible]

Fringe Rate: [illegible]

Human Link	Y1	Y2	Y3	OY1	OY2	Total
A. Senior Key Personnel						
[illegible]	$ 7,770.15	$ 7,770.15	$ 7,770.15	$ 7,705.01	$ 7,705.01	$ [illegible]
	$	$	$	$	$	$
Total Senior Key Personnel	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
B. Other Personnel						
Total Other Personnel	$	$	$	$	$	$
C. Equipment						
Total Equipment	$	$	$	$ -	$ -	$ -
D. Travel						
1. Domestic Travel						$
2. Foreign Travel	$	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 12,588.00
Total Travel	$	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 12,588.00
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$
5. Other						$
Total Participant/Trainee Support Costs	$	$	$	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies		$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Publication Costs						$
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$
6. Equipment or Facility Rental/User Fees						$
7. Alterations and Renovations						$ -
8. Other Savings						$ -
9. Other						$
Total Other Direct Costs	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ 7,770.15	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Modified Direct Costs						$
H. Indirect Costs						
1. Indirect Cost Type	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct + Indirect	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
[illegible]						
Fee						
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

IDC Rate: [illegible] [illegible]

DC Rate: [illegible]

[illegible]						
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$	$	$	$	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	[illegible]	4	8	[illegible]	4	
[illegible]	[illegible]	[illegible]	1	1	[illegible]	
Total	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

						JUST	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
12	12	12	12	12	$ 127,940.00	Dr. Ehab Abu-Basha, CoPI	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 639,700.00
						Dr. Ehab Abu-Basha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
8	8	8	8	8	$ 19,301.80	Hani Talafha, Biologist	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 64,339.33
						Hani Talafha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	12	12	12	12	$ 32,520.00	Zaidoun Hijazeen, Veterinarian	$ 5,420.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 135,500.00
						Zaidoun Hijazeen Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 54,391.53	Mustafa Ababneh, Virologist/Lab Director	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 67,989.41
						Mustafa Ababneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2.5	2.5	2.5	2.5	2.5	$ 57,903.18	Zuhair Bani Ismail, Livestock ID Expert	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 60,315.81
						Zuhair Bani Ismail Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 69,597.00	Borhan Al-zoghoul, Molecular Biologist/Lab Director	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 86,996.25
						Borhan Al-zoghoul Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 23,112.00	Bilal Al-Omari, Lab Supervisor	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 28,890.00
						Bilal Al-Omari Fringe	$ -	$ -	$ -	$ -	$ -	$ -
1	1	1	1	1	$ 77,018.63	Wail Hayajneh, Human ID Expert	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 73,757.76
						Wail Hayajneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
			Fringe Rate-->			Total Senior/Key Personnel	$ 209,817.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 1,157,488.57
						B. Other Personnel						
1	1	1	2	2	$ 58,241.66	Saad Gharaibeh, Avian Pathologist	$ 4,853.47	$ 4,853.47	$ 4,853.47	$ 9,706.94	$ 9,706.94	$ 33,974.30
						Saad Gharaibeh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3.5	3.5	3.5	3.5	3.5	$ 28,219.76	Admin	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 41,152.94
						Admin Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	4	4	3	0	$ 47,860.32	Nurses (x2)	$ 15,953.44	$ 31,906.88	$ 31,906.88	$ 23,930.16	$ -	$ 103,697.36
12	12	12	12	12	$ 2,538.84	Undergrad Student: Stipends (x2)	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 25,388.40
12	12	12	12	12	$ 3,385.08	Graduate Student Stipends (x2)	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 33,850.80
			Fringe Rate-->			Total Other Personnel	$ 40,885.34	$ 56,838.78	$ 56,838.78	$ 53,715.53	$ 29,785.37	$ 204,089.50
						C. Equipment						
						Vehicle	$ 37,150.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 44,470.00
						Luminescence plate reader	$ 28,846.00					
						Total Equipment	$ 65,996.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 73,316.00
						D. Travel						
						1. Domestic Travel	$ 40,108.00	$ 62,626.00	$ 62,626.00	$ 51,367.00	$ 12,360.00	$ 229,087.00
						2. Foreign Travel	$ 37,433.50	$ 26,890.00	$ 26,890.00	$ 26,890.00	$ 29,915.50	$ 148,019.00
						Total Travel	$ 77,541.50	$ 89,516.00	$ 89,516.00	$ 78,257.00	$ 42,275.50	$ 377,106.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 36,933.96	$ 18,784.77	$ 7,666.97	$ 10,255.19	$ -	$ 73,640.89
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other - Testing	$ 53,500.00	$ 53,500.00	$ 77,500.00	$ 65,500.00	$ -	$ 250,000.00
						9. Other - Meetings and Conferences	$ 27,589.08	$ 39,205.05	$ 17,366.69	$ 39,205.05	$ 9,885.27	$ 215,251.14
						Total Other Direct Costs	$ 118,023.04	$ 111,489.82	$ 102,533.66	$ 114,960.24	$ 9,885.27	$ 538,892.03
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 512,263.59	$ 496,592.31	$ 487,636.15	$ 485,680.49	$ 402,693.86	$ 2,384,866.40
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate-->	8%		1. Indirect Cost Type	$ 40,981.09	$ 39,727.39	$ 39,010.89	$ 38,854.44	$ 32,215.51	$ 190,789.31
			IDC Rate-->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	$ 2,575,655.72

International Travel						TOTA…
International Conference (1 MED member)						
Hotel Rate Per Diem	$ 3,276	$ 3,276	$ 3,276	$ 3,276	$ 3,276	
Meals and Incidental Expenses Per Diem	$ 1,683	$ 1,683	$ 1,683	$ 1,683	$ 1,683	
Total Per Diem	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	
Flight Estimate	$ 3,192	$ 3,192	$ 3,192	$ 3,192	$ 3,192	
Per Diem	4	4	4	4	4	
No. Trips per Year	4	4	4	4	4	
Total	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 155,670.00
Program Conference (1 MED Member)						
Hotel Rate Per Diem	$ 3,691	$ 3,691	$ 3,691	$ 3,691	$ 3,691	
Meals and Incidental Expenses Per Diem	$ 1,376	$ 1,376	$ 1,376	$ 1,376	$ 1,376	
Total Per Diem	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	
Flight Estimate	$ 3,698	$ 3,698	$ 3,698	$ 3,698	$ 3,698	
Per Diem	4	4	4	4	4	
No. Trips per Year	1	1	1	1	1	
Total	$ 6,529.50	$ 8,700.00	$ 8,700.00	$ 8,700.00	$ 10,882.50	$ 43,530.00
DTRA Mtg (NA						
Hotel Rate Per Diem	$ 1,293	$ 1,293	$ 1,293	$ 1,293	$ 1,293	
Meals and Incidental Expenses Per Diem	$ 426	$ 426	$ 426	$ 426	$ 426	
Total Per Diem	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	
Flight Estimate	$ 1,083	$ 1,083	$ 1,083	$ 1,083	$ 1,083	
Per Diem	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 19,012.50
Foreign Travel (3 days/1 staffer)						
Hotel Rate Per Diem	$ 5,823	$ -	$ -	$ -	$ -	
Meals and Incidental Expenses Per Diem	$ 3,822	$	$	$	$	
Total Per Diem	$ 1,120.00	$	$	$	$	
Flight Estimate	$ 1,340	$	$	$	$	
Per Diem	7	7	7	7	7	
No. Trips per Year	0	0	0	0	0	
Total	$ 13,560.00	$	$	$	$	$ 13,560.00
Conference Fees	$ 4,540.00	$ 5,300.00	$ 5,300.00	$ 5,300.00	$ 5,345.00	$ 26,080.00
Misc Fees	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 2,500.00
YEARLY TOTALS	$ 37,438.50	$ 26,500.00	$ 26,500.00	$ 26,500.00	$ 29,515.50	$ 148,319.00

	Y1	Y2	Y3	Y4	Y5	
Travelers						
Total (Pax)	164	164	164	164	164	820
Unique Travelers (Individuals)	164	164	164	164	164	820
Total Days	824	824	824	824	824	2830
Conferences						
15 @ 300	2000	2000	2000	2000	2000	10000
191 @ 362	2547	2547	2547	1591	1274	10509
Total Conferences	4547	4547	4547	3591	3274	20509

Annual Conference (Y1, OY2)		6 People	4 Days		
Hotel Rate Per Diem	$ 346.00	10	2	$	$ 6,920.00
M&IE Expenses Per Diem	$ 138.00	10	2	$	$ 2,760.00
Domestic Transport	$ 414.00	10	2	$	$ 8,280.00
Foreign/Supplies	$ 249.00	1	2	$	$ 498.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	45	2	$	$ 3,600.00
					$ 32,882.28
Kickoff Meeting (Y2, OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	6	2	$	$ 4,152.00
M&IE Expenses Per Diem	$ 138.00	6	2	$	$ 1,380.00
Domestic Transport	$ 414.00	6	2	$	$ 3,071.88
Foreign/Supplies	$ 69.00	1	2	$	$ 69.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	20	2	$	$ 1,600.00
					$ 19,222.52
Regional Meeting (Y2, OY2 ONLY)		**8 People**	**3 Days**		
Regional Transport - Lyons	$ 390.00	8	3	$	$ 780.00
Regional Transport - Lexington	$ 409.00	8	3	$	$ 818.00
Regional Transport - Paris	$ 453.00	8	3	$	$ 906.00
Hotel Rate Per Diem	$ 346.00	8	3	$	$ 2,076.00
M&IE Expenses Per Diem	$ 138.00	8	3	$	$ 828.00
Translator and Source	$ 1,974.64	1	3	$	$ 5,923.92
Room Rental	$ 1,950.00	1	3	$	$ 5,850.00
Lunch and Coffee	$ 40.00	45	3	$	$ 5,400.00
					$ 23,580.92
Threat Reduction Workshop (OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	20	4	$	$ 27,680.00
M&IE Expenses Per Diem	$ 138.00	10	4	$	$ 5,520.00
Domestic Transport	$ 414.00	10	4	$	$ 8,280.00
Translator and Source	$ 1,974.64	1	4	$	$ 7,898.56
Room Rental	$ 1,950.00	1	4	$	$ 7,800.00
Lunch and Coffee	$ 40.00	45	4	$	$ 7,200.00
Regional Transport - Lyons	$ 390.00	6	1	$	$ 1,560.00
Regional Transport - Paris	$ 453.00	6	1	$	$ 1,812.00
					$ 67,750.56

	Y1	Y2	Y3	OY1	OY2
Individuals and Group Costs	$ 22,500.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 21,000.00

Field Travel Costs	Y1	Y2	Y3	OY1	OY2
Food/Lodging Per Diems	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$
Fuel	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00
Vehicle Maintenance Costs	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Tokens of Appreciation	$ 20,318.00	$ 27,036.00	$ 27,036.00	$ 25,277.00	$ 10,000.00
TOTAL	$ 40,308.00	$ 64,026.00	$ 62,826.00	$ 53,767.00	$ 32,360.00

Food/Lodging Per Diems	Y1	Y2	Y3	OY1	OY2	
# Trips	2	4	4	3	0	
Per Diem	300	300	300	300	300	(3 Host, 2 Travel in Scale 1)
# days	5	5	5	5	5	
# Pax	5	5	5	5	5	
Total	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$	
Tokens of Appreciation - Items	Y1	Y2	Y3	OY1	OY2	
# Samples/ITF	300	300	300	300	300	
# Quarters	2	4	4	3	0	
Sample Size	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	
Price per Item	$ 11.25	$ 11.25	$ 11.25	$ 11.25	$ 11.25	(11 Items per Scale 1)
Total	$ 7,518.00	$ 18,036.00	$ 18,036.00	$ 12,277.00	$	
Tokens of Appreciation - Camo/Patches	Y1	Y2	Y3	OY1	OY2	
# Samples/ QY	50	50	50	50	50	(50 patches of each type on hand
# Quarters	2	2	2	2	2	x 2 QY Quarters, 0 leftovers after 2 yrs)
Price per Sample	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Total	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	

Travel Costs				
	Y1	Y2	Y3	Total
A. Hamilton	7.75	7.75	$ 1.53	$ 26.66
A. Drake	58.2	58.2	$ 1.53	$ 8.90
A. Kent	262	262	$ 1.53	$ 40.06
Mira	438	438	$ 1.53	$ 67.01
Scales	668	668	$ 1.53	$ 102.16
				$ 245.38
	30000	8030	$ 1.53	$ 4,580.00

Field Supplies			Y1		Y2		Y3		OY1		OY2	
Type	Units/Price	Price	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total
Nunc 1.8 internal cryovials	450	$ 516.42	12	$ 6,197.04	17	$ 8,779.14	8	$ 4,131.36	10	$ 5,164.20		
Serum tubes 10 mL	100	31.09	25	$ 777.25	23	$ 715.07	12	$ 373.08	12	$ 373.08		
Serum tubes 3 mL	100	27.31	2	$ 54.62	0	$ -	1	$ 27.31		$ -		
Vacutainer holder	250	$ 20.77	50	$ 1,038.50	50	$ 1,038.50		$ -		$ -		
21g 1in vacutainer safety needles	48	$ 39.92	30	$ 1,197.60	28	$ 1,117.76	15	$ 598.80	14	$ 558.88		
18g 1in vacutainer needles	100	$ 32.19	5	$ 160.95	5	$ 160.95	3	$ 96.57	2	$ 64.38		
3cc luer lock syringe	100	$ 21.80	2	$ 43.60		$	1	$ 21.80		$		
22g 1in needle	100	$ 19.80	2	$ 39.60		$ -	1	$ 19.80		$ -		
Cotton Swabs	500	$ 400.00	5	$ 2,000.00	10	$ 4,000.00	0	$	5	$ 2,000.00		
Gloves	50	$ 29.65	7	$ 207.55	14	$ 415.10	0	$ -	6	$ 177.90	0	$ -
Masks N95	50	$ 47.75	7	$ 334.25	7	$ 334.25	7	$ 334.25	5	$ 238.75	0	$
Tyvek Suits (project supply)	25	$ 350.00	52	$ 18,200.00	0	$ -	0	$ -	0	$ -	0	$ -
Goggles (project supply)	12	$ 135.00	2	$ 270.00	0	$ -	0	$ -	0	$ -	0	$ -
Booties (project supply)	200	$ 300.00	7	$ 2,100.00	0	$ -	0	$ -	0	$ -	0	$ -
Biohazard Bag (project supply)	200	$ 155.00	2	$ 310.00	0	$ -	0	$ -	0	$ -	0	$ -
Sharps Container	20	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00		$ -
Alcohol Swabs	1200	$ 32.00	4	$ 128.00	7	$ 224.00	2	$ 64.00	4	$ 128.00		$ -
Tablets	1	$ 200.00	5	$ 1,000.00		$		$		$		$
Dry Ice	1 week	$ 150.00	6	$ 900.00	12	$ 1,800.00	12	$ 1,800.00	9	$ 1,350.00		$ -
Eye wash station	1	$ 275.00	1	$ 275.00		$		$		$		$
Card reader system		$ 1,500.00	1	$ 1,500.00		$ -		$ -		$ -		$ -
TOTALS				**$ 36,933.96**		**$ 18,784.77**		**$ 7,666.97**		**$ 10,255.19**		**$ -**

Nunc 1.8 internal cryovials	PCRs - 2 swabs/animal or person
Serum tubes 10 mL	1 per human, 2 per animal serology
Serum tubes 3 mL	1 per chicken serology
Vacutainer holder	100
21g 1in vacutainer safety needles	1 per human serology
18g 1in vacutainer needles	1 per camel serology
3cc luer lock syringe	1 per chicken serology
22g 1in needle	1 per chicken serology
Cotton Swabs	PCRs - 2 swabs/animal or person

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
MERS PCR camels	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$ -
A PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
A PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
A PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
MERS Serology Humans PP	330	$ 40.00	$ 13,200.00	0	$ 40.00	$ -	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 13,200.00			
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$ -	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
A serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$ -	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$ -
A serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$
A serology Subtype Tesing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$ -	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$ -
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$ -	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$ -
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$ -	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$ -
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto Serovar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$ -			$ -			$ -			$ -			$ -
Lepto PCR camels			$ -			$ -			$ -			$ -			$ -
Lepto PCR other ruminants			$ -			$ -			$ -			$ -			$ -
			$ -			$ -			$ -			$ -			$ -
		Y1 Total	$ 53,500.00		Y2 Total	$ 51,500.00		Y3 Total	$ 77,500.00		OY1 Total	$ 65,500.00		OY2 Total	$ -

(b)(6)

Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Much appreciated,(b)(6)

I cannot imagine how you get through all these documents. We only have a few proposals/awards to justify and it seems like an enormous task for us!

If I may help you quickly locate certain documents in our forms and files, please call or text my handphone anytime day or night.

Many thanks again!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

(b)(6) < tel:1.646.413.3437 > (mobile)
Caution-www.ecohealthalliance.org <http://caution-www.ecohealthalliance.org/> < Caution-http://www.ecohealthalliance.org >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 2, 2020, at 12:17, (b)(6) <(b)(6) > wrote:

Yes , they were received. Thank you

-----Original Message-----
From: William B. Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> < Caution-mailto:karesh@ecohealthalliance.org > >
Sent: Wednesday, September 2, 2020 11:16 AM
To: (b)(6) (b)(6) >
Cc: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> < Caution-mailto:chmura@ecohealthalliance.org > >
Subject: Fwd: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the

authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I just wanted to confirm that you received the email below earlier this week.

Thanks!!

William B. Karesh, D.V.M
Executive Vice President for Health and Policy

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018 USA

+1.212.380.4463 (direct)
+1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

Begin forwarded message:

From:Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> < Caution-mailto:chmura@ecohealthalliance.org > < Caution-Caution-mailto:chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > > >

Subject:Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

Date:August 30, 2020 at 8:14:36 PM EDT

To: (b)(6) (b)(6) Caution- > > >

Cc: (b)(6) (b)(6) : Caution-Caution-mailto:adrea.a.robinson.civ@mail.mil < Caution-mailto:adrea.a.robinson.civ@mail.mil > > >, Billy Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> < Caution-mailto:karesh@ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > > >, Whitney Bagge <bagge@ecohealthalliance.org <mailto:bagge@ecohealthalliance.org> < Caution-mailto:bagge@ecohealthalliance.org > < Caution-Caution-mailto:bagge@ecohealthalliance.org < Caution-mailto:bagge@ecohealthalliance.org > > >, Catherine Machalaba <machalaba@ecohealthalliance.org <mailto:machalaba@ecohealthalliance.org> < Caution-mailto:machalaba@ecohealthalliance.org > < Caution-Caution-mailto:machalaba@ecohealthalliance.org < Caution-mailto:machalaba@ecohealthalliance.org > > >, Joe Riccardi <riccardi@ecohealthalliance.org <mailto:riccardi@ecohealthalliance.org> < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > >

Dear (b)(6)

Please find attached seven files:

1) FRBAA14-6-2-0471_Clarifications_FINAL.xlsx
2) EHA Budget Justification_FINAL.docx
3) EHA Documentation_FINAL.pdf
4) Human Link Budget Justification_FINAL.docx
5) Human Link Documentation_FINAL.pdf
6) JUST Budget Justification_FINAL.docx
7) JUST Documentation_FINAL.pdf

There are three sets of paired files with the requested documentation (PDFs) and track-change budget justifications (MS Word) for EcoHealth Alliance and our two subcontracts under this proposal. We have also included the clarifications (MS Excel) with responses to the specific questions in each tab.

Please let me know, if there are additional questions or any other documentation is required.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 < tel:1.212.380.4469 > > (office)
(b)(6) > (mobile)
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EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

From: Aleksei Chmura
To: (b)(6)
Cc: Robinson, Adrea A CIV (USA); Whitney Bagge; Joe Riccardi; Billy Karesh
Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications
Date: Thursday, September 17, 2020 11:38:05 AM
Attachments: DTRA Jordan Budget 28 Aug 2020.xlsx

Dear (b)(6)

Please find our excel file with a breakdown of EcoHealth Alliance costs and with separate tabs for our subcontracts.

Call me anytime, if you have additional questions or need other documents.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 > (office)
(b)(6) (mobile)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 14, 2020, at 11:23, (b)(6) > wrote:

Good morning,

Thank you for documents as they will come in handy. Would you be able to provide an excel breakdown of EHA and subs?

-----Original Message-----
From: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> >
Sent: Wednesday, September 2, 2020 12:34 PM
To: (b)(6)

Y1	Y2	Y3	Y4	Y5	OY2	Base
2	2	2	2	2	$	291,477.26
2	2	2	2	2	$	67,747.18
4	4	4	4	3	$	85,884.88
2	2	2	2	2	$	93,109.09
					Fringe Rate =	36.50%
1	1	1	1	1	$	59,727.47
12	12	12	12	12	$	81,013.16
					Fringe Rate =	36.50%

PRIME Budget	Y1	Y2	Y3	OY2	Total
A. Senior Key Personnel					
Arthur, Kenneth, PI	$ 46,506.23	$ 48,181.85	$ 53,810.46	$ 56,765.86	$ 205,264.40
Arthur, Kenneth, Fringe	$ 17,854.85	$ 18,758.30	$ 20,661.28	$ 21,794.79	$ 78,969.22
Early, Megan, Behavioral Risk Scientist	$ 16,806.80	$ 17,733.84	$ 18,712.14	$ 19,745.18	$ 72,997.96
Early, Megan, Fringe	$ 6,232.74	$ 6,544.38	$ 6,871.60	$ 7,215.18	$ 26,863.84
Collins, Ward, Abdul, Co-Principal Inv	$ 28,928.29	$ 30,029.71	$ 31,362.96	$ 33,140.83	$ 123,461.79
Collins, Ward, Abdul, Fringe	$ 10,563.21	$ 10,961.97	$ 11,615.20	$ 12,096.62	$ 45,136.99
Whitney, Beggie, Modeler	$ 14,050.71	$ 15,007.92	$ 15,821.06	$ 17,412.05	$ 62,291.40
Whitney, Beggie, Fringe	$ 5,356.94	$ 5,544.65	$ 5,822.13	$ 6,113.27	$ 23,175.99
Total Senior Key Personnel	$ 146,056.75	$ 155,779.12	$ 165,547.26	$ 174,725.42	$ 638,253.79
B. Other Personnel					
Omenetto, Emily, Program Coordinator	$ 14,497.05	$ 15,007.47	$ 15,811.41	$ 17,201.70	$ 62,517.64
Omenetto, Emily, Fringe	$ 5,291.95	$ 5,477.73	$ 5,771.17	$ 6,278.62	$ 22,819.46
Research Assistant	$ 53,274.00	$ 54,870.00	$ 56,516.10	$ 58,211.58	$ 222,871.68
RA Fringe	$ 19,447.01	$ 20,030.42	$ 20,631.33	$ 21,250.27	$ 81,358.03
Total Other Personnel	$ 103,853.01	$ 108,385.62	$ 114,830.01	$ 123,268.18	$ 430,366.81
C. Equipment					
Total Equipment	$ -	$ -	$ -	$ -	$ -
D. Travel					
1 Domestic Travel	$ 4,690.69	$ 7,331.69	$ 7,562.50	$ 7,942.69	$ 33,858.69
2 Foreign Travel	$ 31,016.69	$ 31,532.50	$ 32,039.50	$ 32,039.50	$ 134,273.69
Total Travel	$ 35,213.99	$ 38,864.19	$ 39,702.30	$ 39,982.19	$ 168,132.69
E. Participant, Trainee Support Costs					
1 Tuition, Fees, Health Insurance					$ -
2 Stipends					$ -
3 Travel					$ -
4 Subsistence					$ -
5 Other					$ -
Total Participant, Trainee Support Costs	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs					
1 Materials and Supplies	$ 2,346.46	$ 2,417.85	$ 2,317.86	$ 2,317.89	$ 17,415.46
2 Publication Costs	$ -	$ 5,265.00	$ 5,265.00	$ -	$ 10,530.00
3 Consultant Services	$ 1,500.00	$ 500.00	$ 500.00	$ 500.00	$ 3,000.00
4 ADP Computer Services					$ -
5 Subawards, Consortium/Contractual Costs					$ -
UGA	$ 553,234.00	$ 530,319.00	$ 529,647.00	$ 524,524.00	$ 2,577,055.72
Fringe Cost	$ 3,275.17	$ 14,140.97	$ 12,140.97	$ 12,140.97	$ 55,042.05
6 Equipment or Facility Rental, User Fees					$ -
7 Alterations and Renovations					$ -
8 Other					$ -
9 Other					$ -
Total Other Direct Costs	$ 10,346.46	$ 8,017.54	$ 8,017.54	$ 2,817.89	$ 35,945.46
G. Direct Costs, excl Modified Total Direct Costs					
Direct Costs	$ 3,307,287.81	$ 3,513,727.80	$ 3,339,881.36	$ 3,353,665.67	$ 13,514,563.64
Modified Direct Costs					$ -
H. Indirect Costs					
1 Indirect Cost Type	$ 136,336.66	$ 112,439.77	$ 118,869.31	$ 121,797.66	$ 489,383.66
2 Indirect Cost Type	$ 11,995.93	$ 9,029.99	$ 352.38	$ -	$ 12,930.69
I. Total Direct and Indirect Costs					
Direct + Indirect	$ 422,920.69	$ 437,234.69	$ 459,330.23	$ 481,294.20	$ 1,800,780.11
J. Fee					
Fee					
K. Total Costs and Fee					
Total Costs	$ 3,730,208.50	$ 3,951,962.49	$ 3,799,211.59	$ 3,834,959.87	$ 15,315,343.75
Cost Share Terms					
	$ 864,386.84	$ 911,865.65	$ 881,176.15	$ 889,987.39	$ 3,547,416.05

RMS Supplies	Description	Y1	Y2	Y3	OY1	OY2	
Laptop	$ 2,500.00	$ 5,000.00					$ 5,000.00
Desk	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Projector	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 2,400.00
Printer	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 1,749.95
Tablet	$ 349.99	$ 349.99					$ 349.99
Software	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 1,500.00
Computer Mouse	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 250.00
Tablet	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 1,750.00
Hard Drive	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 375.00
TOTALS		$ 6,400.45	$ 1,533.98	$ 1,812.98	$ 2,332.98	$ 1,812.98	$ 13,400.45

Consultant Services	Y1	Y2	Y3	OY1	OY2
Rate	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00
# of Trainings	$ 3,000.00				
TOTAL	$ 3,500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00

Publication Costs	Y1	Y2	Y3	OY1	OY2
Page Charge		$ 5,265.00			
Subscription Rate		$ 5,265.00			
TOTAL	$ -	$ 10,530.00	$ -	$ -	$ -

International Travel						TOTAL
Traveler 1 - William Karesh (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 3,780.00	$ 29,164.00
Traveler 2 - William Karesh (Field)						
Hotel Max Per Diem	$ 584.00	$ 584.00	$ 584.00	$ 584.00	$ 584.00	
Meals and Incidental Expenses Per Diem	$ 472.50	$ 472.50	$ 472.50	$ 472.50	$ 472.50	
Taxi Estimate	$ 285.00	$ 285.00	$ 285.00	$ 285.00	$ 285.00	
Flight Estimate						
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 8,707.50
Traveler 3 - Catherine Machalaba (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$ 2,566	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 31,730.00
Traveler 4 - Catherine Machalaba (Field)						
Hotel Max Per Diem	$ 1,414.00	$ 1,578.30	$ 2,628.00	$ 2,628.30	$ 2,628.00	
Meals and Incidental Expenses Per Diem	$ 997.50	$ 1,395.30	$ 1,995.00	$ 1,995.30	$ 1,995.00	
Taxi Estimate	$ 435.00	$ 870.30	$ 870.00	$ 870.30	$ 870.00	
Flight Estimate						
No. Days	10	10	10	10	10	
No. Trips per Year	1	2	1	2	1	
Total	$ 2,746.50	$ 5,493.30	$ 5,493.00	$ 5,493.30	$ 5,493.00	$ 24,718.90
Traveler 5 - Emily Bogan (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.30	$ 1,968.00	$ 1,968.30	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.30	$ 1,242.00	$ 1,242.30	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 6,415	$ 6,415	$ 6,415	$ 6,415	$ 6,415	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 52,975.00

Traveler 5 - International Conference (IUCN)	Vietnam					
Hotel Max Per Diem	$ 819	$ 819	$ 1,638	$ 1,638	$ 1,638	
Meals and Incidental Expenses Per Diem	$ 480	$ 480	$ 480	$ 480	$ 480	
Taxi Estimate	$ 285.00	$ 285.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 1,493	$ 1,493	$ 2,986	$ 2,986	$ 2,986	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	2	2	2	
Total	$ 2,607.00	$ 2,807.30	$ 5,614.00	$ 5,814.30	$ 5,614.00	$ 22,456.00
Visa Fees	$ 504.00	$ 504.30	$ 504.00	$ 504.30	$ 504.00	$ 2,520.00
Vaccination Costs	$ 850.00					$ 850.00
Conference Registration Fees	$ 500.00	$ 500.30	$ 1,000.00	$ 1,000.30	$ 1,000.00	$ 4,000.00
YEARLY TOTALS	$ 31,016.00	$ 42,542.50	$ 56,869.50	$ 86,849.50	$ 54,473.50	$ 271,101.00
conference			visa			
$ DAILY	520		Jansen	58		

Domestic Travel						TOTAL
Traveler 1 - William Karesh (NY DC)						
Hotel Max Per Diem	$ 512	$ 256	$ 512	$ 512	$ 512	
Meals and Incidental Expenses Per Diem	$ 128	$ 114	$ 128	$ 128	$ 128	
Taxi Estimate	$ 90.00	$ 45.00	$ 90.00	$ 90.00	$ 90.00	
Transportation Estimate	$ 492	$ 156	$ 492	$ 492	$ 492	
No. Days	2	2	2	2	2	
No. Trips per Year	2	1	2	2	2	
Total	$ 1,222.00	$ 614.00	$ 1,222.00	$ 1,222.00	$ 1,222.00	$ 5,499.00
Traveler 2 - Catherine Machalaba (NY DC)						
Hotel Max Per Diem	$ 256	$ 256	$ 256	$ 256	$ 256	
Meals and Incidental Expenses Per Diem	$ 114	$ 114	$ 114	$ 114	$ 114	
Taxi Estimate	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	
Transportation Estimate	$ 196	$ 196	$ 196	$ 196	$ 196	
No. Days	2	2	2	2	2	
No. Trips per Year	1	1	1	1	1	
Total	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 3,055.00
Traveler 3 - Attend no Meeting in VA						
Hotel Max Per Diem	$ 1,024	$ 1,024	$ 1,024	$ 1,024	$ 1,024	
Meals and Incidental Expenses Per Diem	$ 380	$ 380	$ 380	$ 380	$ 380	
Taxi Estimate	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	
Transportation Estimate	$ 1,011	$ 1,011	$ 1,011	$ 1,011	$ 1,011	
No. Days	4	4	4	4	4	
No. Trips per Year	2	2	2	2	2	
Total	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 14,324.00
Traveler 4 - Presenting Domestic Mtg ASTMH (Maryland)						
Hotel Max Per Diem	$	$ 924	$ 924	$ 924	$ 924	
Meals and Incidental Expenses Per Diem	$ -	$ 497	$ 497	$ 497	$ 497	
Taxi Estimate	$ -	$ 210.00	$ 210.00	$ 210.00	$ 210.00	
Transportation Estimate	$ -	$ 684	$ 684	$ 684	$ 684	
No. Days	3	4	4	4	4	
Prep + Attending	3	2	2	2	2	
Total	$ -	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 9,260.00

Conference Registration Fees	$ -	$ 930.00	$ 930.00	$ 930.00	$ 930.00	
YEARLY TOTALS	$ 4,697.80	$ 7,421.80	$ 7,942.80	$ 7,942.80	$ 7,942.80	$ 35,168.00
/month	$ 469.78					

Y1	Y2	Y3	OY1	OY2	Base
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$ [illegible]
Fringe Rate [illegible]					
IDC Rate [illegible]		IDC Base [illegible]			

Human Link	Y1	Y2	Y3	OY1	OY2	Total
A. Senior Key Personnel						
Graduate/Co-Investigator	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
	$	$	$	$	$	$
Total Senior Key Personnel	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
B. Other Personnel						
Total Other Personnel	$	$	$	$	$	$
C. Equipment						
Total Equipment	$	$	$	$ -	$ -	$ -
D. Travel						
1. Domestic Travel						$
2. Foreign Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Total Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$
5. Other						$
Total Participant/Trainee Support Costs	$	$	$	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies		$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Publication Costs						$
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$
6. Equipment or Facility Rental/User Fees						$
7. Alterations and Renovations						$ -
8. Other (Testing)						$ -
9. Other						$
Total Other Direct Costs	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Modified Direct Costs						$
H. Indirect Costs						
1. Indirect Cost Type	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct + Indirect	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
J. Fee						
Fee						
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

[illegible]						
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$		$	$	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

						JUST	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
12	12	12	12	12	$ 127,940.00	Dr. Ehab Abu-Basha, CoPI	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 639,700.00
						Dr. Ehab Abu-Basha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
8	8	8	8	8	$ 19,301.80	Hani Talafha, Biologist	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 64,339.33
						Hani Talafha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	12	12	12	12	$ 32,520.00	Zaidoun Hijazeen, Veterinarian	$ 5,420.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 135,500.00
						Zaidoun Hijazeen Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 54,391.53	Mustafa Ababneh, Virologist/Lab Director	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 67,989.41
						Mustafa Ababneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2.5	2.5	2.5	2.5	2.5	$ 57,903.18	Zuhair Bani Ismail, Livestock ID Expert	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 60,315.81
						Zuhair Bani Ismail Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 69,597.00	Borhan Al-zoghoul, Molecular Biologist/Lab Director	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 86,996.25
						Borhan Al-zoghoul Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 23,112.00	Bilal Al-Omari, Lab Supervisor	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 28,890.00
						Bilal Al-Omari Fringe	$ -	$ -	$ -	$ -	$ -	$ -
1	1	1	1	1	$ 77,018.63	Wail Hayajneh, Human ID Expert	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 73,757.76
						Wail Hayajneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
			Fringe Rate-->			Total Senior/Key Personnel	$ 209,817.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 1,157,488.57
						B. Other Personnel						
1	1	1	2	2	$ 58,241.66	Saad Gharaibeh, Avian Pathologist	$ 4,853.47	$ 4,853.47	$ 4,853.47	$ 9,706.94	$ 9,706.94	$ 33,974.30
						Saad Gharaibeh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3.5	3.5	3.5	3.5	3.5	$ 28,219.76	Admin	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 41,152.94
						Admin Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	4	4	3	0	$ 47,860.32	Nurses (x2)	$ 15,953.44	$ 31,906.88	$ 31,906.88	$ 23,930.16	$ -	$ 103,697.36
12	12	12	12	12	$ 2,538.84	Undergrad Student: Stipends (x2)	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 25,388.40
12	12	12	12	12	$ 3,385.08	Graduate Student Stipends (x2)	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 33,850.80
			Fringe Rate-->			Total Other Personnel	$ 40,885.34	$ 56,838.78	$ 56,838.78	$ 53,715.53	$ 29,785.37	$ 204,089.50
						C. Equipment						
						Vehicle	$ 37,150.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 44,470.00
						Luminescence plate reader	$ 28,846.00					
						Total Equipment	$ 65,996.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 73,316.00
						D. Travel						
						1. Domestic Travel	$ 40,108.00	$ 62,626.00	$ 62,626.00	$ 51,367.00	$ 12,360.00	$ 229,087.00
						2. Foreign Travel	$ 37,433.50	$ 26,890.00	$ 26,890.00	$ 26,890.00	$ 29,915.50	$ 148,019.00
						Total Travel	$ 77,541.50	$ 89,516.00	$ 89,516.00	$ 78,257.00	$ 42,275.50	$ 377,106.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 36,933.96	$ 18,784.77	$ 7,666.97	$ 10,255.19	$ -	$ 73,640.89
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other - Testing	$ 53,500.00	$ 53,500.00	$ 77,500.00	$ 65,500.00	$ -	$ 250,000.00
						9. Other - Meetings and Conferences	$ 27,589.08	$ 39,205.05	$ 17,366.69	$ 39,205.05	$ 9,885.27	$ 215,251.14
						Total Other Direct Costs	$ 118,023.04	$ 111,489.82	$ 102,533.66	$ 114,960.24	$ 9,885.27	$ 538,892.03
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 512,263.59	$ 496,592.31	$ 487,636.15	$ 485,680.49	$ 402,693.86	$ 2,384,866.40
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate-->	8%		1. Indirect Cost Type	$ 40,981.09	$ 39,727.39	$ 39,010.89	$ 38,854.44	$ 32,215.51	$ 190,789.31
			IDC Rate-->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	$ 2,575,655.72

International Travel						TOTA…
International Conference (1 MED member)						
Hotel Rate Per Diem	$ 3,276	$ 3,276	$ 3,276	$ 3,276	$ 3,276	
Meals and Incidental Expenses Per Diem	$ 1,683	$ 1,683	$ 1,683	$ 1,683	$ 1,683	
Total Per Diem	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	
Flight Estimate	$ 3,192	$ 3,192	$ 3,192	$ 3,192	$ 3,192	
Per Diem	4	4	4	4	4	
No. Trips per Year	4	4	4	4	4	
Total	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 155,670.00
Program Conference (1 MED Member)						
Hotel Rate Per Diem	$ 3,691	$ 3,691	$ 3,691	$ 3,691	$ 3,691	
Meals and Incidental Expenses Per Diem	$ 1,376	$ 1,376	$ 1,376	$ 1,376	$ 1,376	
Total Per Diem	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	
Flight Estimate	$ 3,698	$ 3,698	$ 3,698	$ 3,698	$ 3,698	
Per Diem	4	4	4	4	4	
No. Trips per Year	1	1	1	1	1	
Total	$ 6,529.50	$ 8,700.00	$ 8,700.00	$ 8,700.00	$ 10,882.50	$ 43,530.00
DTRA Mtg (NA						
Hotel Rate Per Diem	$ 1,293	$ 1,293	$ 1,293	$ 1,293	$ 1,293	
Meals and Incidental Expenses Per Diem	$ 426	$ 426	$ 426	$ 426	$ 426	
Total Per Diem	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	
Flight Estimate	$ 1,083	$ 1,083	$ 1,083	$ 1,083	$ 1,083	
Per Diem	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 19,012.50
Foreign Travel (3 days/1 staffer)						
Hotel Rate Per Diem	$ 5,823	$ -	$ -	$ -	$ -	
Meals and Incidental Expenses Per Diem	$ 3,822	$	$	$	$	
Total Per Diem	$ 1,120.00	$	$	$	$	
Flight Estimate	$ 1,340	$	$	$	$	
Per Diem	7	7	7	7	7	
No. Trips per Year	0	0	0	0	0	
Total	$ 13,560.00	$	$	$	$	$ 13,560.00
Conference Fees	$ 4,540.00	$ 5,300.00	$ 5,300.00	$ 5,300.00	$ 5,345.00	$ 26,080.00
Misc Fees	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 2,500.00
YEARLY TOTALS	$ 37,438.50	$ 26,500.00	$ 26,500.00	$ 26,500.00	$ 29,515.50	$ 148,319.00

	Y1	Y2	Y3	Y4	Y5	
Travelers						
Total (Pax)	164	164	164	164	164	820
Unique Travelers (Individuals)	164	164	164	164	164	820
Total Days	824	824	824	824	824	2830
Conferences						
15 @ 300	2000	2000	2000	2000	2000	10000
191 @ 362	2547	2547	2547	1591	1274	10509
Total Conferences	4547	4547	4547	3591	3274	20509

Annual Conference (Y1, OY2)		6 People	4 Days		
Hotel Rate Per Diem	$ 346.00	10	2	$	$ 6,920.00
M&IE Expenses Per Diem	$ 138.00	10	2	$	$ 2,760.00
Domestic Transport	$ 414.00	10	2	$	$ 8,280.00
Foreign/Supplies	$ 249.00	1	2	$	$ 498.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	45	2	$	$ 3,600.00
					$ 32,882.28
Kickoff Meeting (Y2, OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	6	2	$	$ 4,152.00
M&IE Expenses Per Diem	$ 138.00	6	2	$	$ 1,380.00
Domestic Transport	$ 414.00	6	2	$	$ 3,071.88
Foreign/Supplies	$ 69.00	1	2	$	$ 69.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	20	2	$	$ 1,600.00
					$ 19,222.52
Regional Meeting (Y2, OY2 ONLY)		**8 People**	**3 Days**		
Regional Transport - Lyons	$ 390.00	8	3	$	$ 780.00
Regional Transport - Lexington	$ 409.00	8	3	$	$ 818.00
Regional Transport - Paris	$ 453.00	8	3	$	$ 906.00
Hotel Rate Per Diem	$ 346.00	8	3	$	$ 2,076.00
M&IE Expenses Per Diem	$ 138.00	8	3	$	$ 828.00
Translator and Source	$ 1,974.64	1	3	$	$ 5,923.92
Room Rental	$ 1,950.00	1	3	$	$ 5,850.00
Lunch and Coffee	$ 40.00	45	3	$	$ 5,400.00
					$ 23,580.92
Threat Reduction Workshop (OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	20	4	$	$ 27,680.00
M&IE Expenses Per Diem	$ 138.00	10	4	$	$ 5,520.00
Domestic Transport	$ 414.00	10	4	$	$ 8,280.00
Translator and Source	$ 1,974.64	1	4	$	$ 7,898.56
Room Rental	$ 1,950.00	1	4	$	$ 7,800.00
Lunch and Coffee	$ 40.00	45	4	$	$ 7,200.00
Regional Transport - Lyons	$ 390.00	6	1	$	$ 1,560.00
Regional Transport - Paris	$ 453.00	6	1	$	$ 1,812.00
					$ 67,750.56

	Y1	Y2	Y3	OY1	OY2
Individuals and Group Costs	$ 22,500.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 21,000.00

Field Travel Costs	Y1	Y2	Y3	OY1	OY2
Food/Lodging Per Diems	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$
Fuel	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00
Vehicle Maintenance Costs	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Tokens of Appreciation	$ 20,318.00	$ 27,036.00	$ 27,036.00	$ 25,277.00	$ 10,000.00
TOTAL	$ 40,308.00	$ 64,026.00	$ 62,826.00	$ 53,767.00	$ 32,360.00

Food/Lodging Per Diems	Y1	Y2	Y3	OY1	OY2	
# Trips	2	4	4	3	0	
Per Diem	300	300	300	300	300	(3 Host, 2 Travel in Scale 1)
# days	5	5	5	5	5	
# Pax	5	5	5	5	5	
Total	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$	
Tokens of Appreciation - Items	Y1	Y2	Y3	OY1	OY2	
# Samples/ITF	300	300	300	300	300	
# Quarters	2	4	4	3	0	
Sample Size	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	
Price per Item	$ 11.25	$ 11.25	$ 11.25	$ 11.25	$ 11.25	(11 Items per Scale 1)
Total	$ 7,518.00	$ 18,036.00	$ 18,036.00	$ 12,277.00	$	
Tokens of Appreciation - Camo/Patches	Y1	Y2	Y3	OY1	OY2	
# Samples/ QY	50	50	50	50	50	(50 patches of each type on hand
# Quarters	2	2	2	2	2	x 2 QY Quarters, 0 leftovers after 2 yrs)
Price per Sample	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Total	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	

Travel Costs				
	Y1	Y2	Y3	Total
A. Hamilton	7.75	7.75	$ 1.53	$ 26.66
A. Drake	58.2	58.2	$ 1.53	$ 8.90
A. Kent	262	262	$ 1.53	$ 40.06
Mira	438	438	$ 1.53	$ 67.01
Scales	668	668	$ 1.53	$ 102.16
				$ 245.38
	30000	8030	$ 1.53	$ 4,580.00

Field Supplies			Y1		Y2		Y3		OY1		OY2	
Type	Units/Price	Price	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total
Nunc 1.8 internal cryovials	450	$ 516.42	12	$ 6,197.04	17	$ 8,779.14	8	$ 4,131.36	10	$ 5,164.20		
Serum tubes 10 mL	100	31.09	25	$ 777.25	23	$ 715.07	12	$ 373.08	12	$ 373.08		
Serum tubes 3 mL	100	27.31	2	$ 54.62	0	$ -	1	$ 27.31		$ -		
Vacutainer holder	250	$ 20.77	50	$ 1,038.50	50	$ 1,038.50		$ -		$ -		
21g 1in vacutainer safety needles	48	$ 39.92	30	$ 1,197.60	28	$ 1,117.76	15	$ 598.80	14	$ 558.88		
18g 1in vacutainer needles	100	$ 32.19	5	$ 160.95	5	$ 160.95	3	$ 96.57	2	$ 64.38		
3cc luer lock syringe	100	$ 21.80	2	$ 43.60		$	1	$ 21.80		$		
22g 1in needle	100	$ 19.80	2	$ 39.60		$ -	1	$ 19.80		$ -		
Cotton Swabs	500	$ 400.00	5	$ 2,000.00	10	$ 4,000.00	0	$	5	$ 2,000.00		
Gloves	50	$ 29.65	7	$ 207.55	14	$ 415.10	0	$ -	6	$ 177.90	0	$ -
Masks N95	50	$ 47.75	7	$ 334.25	7	$ 334.25	7	$ 334.25	5	$ 238.75	0	$
Tyvek Suits (project supply)	25	$ 350.00	52	$ 18,200.00	0	$ -	0	$ -	0	$ -	0	$ -
Goggles (project supply)	12	$ 135.00	2	$ 270.00	0	$ -	0	$ -	0	$ -	0	$ -
Booties (project supply)	200	$ 300.00	7	$ 2,100.00	0	$ -	0	$ -	0	$ -	0	$ -
Biohazard Bag (project supply)	200	$ 155.00	2	$ 310.00	0	$ -	0	$ -	0	$ -	0	$ -
Sharps Container	20	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00		$ -
Alcohol Swabs	1200	$ 32.00	4	$ 128.00	7	$ 224.00	2	$ 64.00	4	$ 128.00		$ -
Tablets	1	$ 200.00	5	$ 1,000.00		$		$		$		$
Dry Ice	1 week	$ 150.00	6	$ 900.00	12	$ 1,800.00	12	$ 1,800.00	9	$ 1,350.00		$ -
Eye wash station	1	$ 275.00	1	$ 275.00		$		$		$		$
Card reader system		$ 1,500.00	1	$ 1,500.00		$ -		$ -		$ -		$ -
TOTALS				**$ 36,933.96**		**$ 18,784.77**		**$ 7,666.97**		**$ 10,255.19**		**$ -**

Nunc 1.8 internal cryovials	PCRs - 2 swabs/animal or person
Serum tubes 10 mL	1 per human, 2 per animal serology
Serum tubes 3 mL	1 per chicken serology
Vacutainer holder	100
21g 1in vacutainer safety needles	1 per human serology
18g 1in vacutainer needles	1 per camel serology
3cc luer lock syringe	1 per chicken serology
22g 1in needle	1 per chicken serology
Cotton Swabs	PCRs - 2 swabs/animal or person

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
MERS PCR camels	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$ -
A PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
A PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
A PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
MERS Serology Humans PP	330	$ 40.00	$ 13,200.00	0	$ 40.00	$ -	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 13,200.00			
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$ -	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
A serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$ -	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$ -
A serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$
A serology Subtype Tesing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$ -	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$ -
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$ -	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$ -
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$ -	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$ -
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto Serovar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$ -			$ -			$ -			$ -			$ -
Lepto PCR camels			$ -			$ -			$ -			$ -			$ -
Lepto PCR other ruminants			$ -			$ -			$ -			$ -			$ -
			$ -			$ -			$ -			$ -			$ -
		Y1 Total	$ 53,500.00		Y2 Total	$ 51,500.00		Y3 Total	$ 77,500.00		OY1 Total	$ 65,500.00		OY2 Total	$ -

(b)(6)

Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Much appreciated (b)(6)

I cannot imagine how you get through all these documents. We only have a few proposals/awards to justify and it seems like an enormous task for us!

If I may help you quickly locate certain documents in our forms and files, please call or text my handphone anytime day or night.

Many thanks again!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

(b)(6) (mobile)
Caution-www.ecohealthalliance.org <http://caution-www.ecohealthalliance.org/> <
Caution-http://www.ecohealthalliance.org >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 2, 2020, at 12:17, (b)(6)
<(b)(6) > wrote:

Yes , they were received. Thank you

-----Original Message-----
From: William B. Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> <
Caution-mailto:karesh@ecohealthalliance.org > >
Sent: Wednesday, September 2, 2020 11:16 AM
To: (b)(6)
<(b)(6)
Cc: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> <
Caution-mailto:chmura@ecohealthalliance.org > >
Subject: Fwd: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the

authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I just wanted to confirm that you received the email below earlier this week.

Thanks!!

William B. Karesh, D.V.M
Executive Vice President for Health and Policy

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018 USA

+1.212.380.4463 (direct)
+1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

Begin forwarded message:

From:Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> < Caution-mailto:chmura@ecohealthalliance.org > < Caution-Caution-mailto:chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > > >

Subject:Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

Date:August 30, 2020 at 8:14:36 PM EDT

To: (b)(6) < (b)(6) < Caution-Caution (b)(6) > >

Cc: (b)(6) (b)(6) Caution- > >>, Billy Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> < Caution-mailto:karesh@ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > > >, Whitney Bagge <bagge@ecohealthalliance.org <mailto:bagge@ecohealthalliance.org> < Caution-mailto:bagge@ecohealthalliance.org > < Caution-Caution-mailto:bagge@ecohealthalliance.org < Caution-mailto:bagge@ecohealthalliance.org > > >, Catherine Machalaba <machalaba@ecohealthalliance.org <mailto:machalaba@ecohealthalliance.org> < Caution-mailto:machalaba@ecohealthalliance.org > < Caution-Caution-mailto:machalaba@ecohealthalliance.org < Caution-mailto:machalaba@ecohealthalliance.org > > >, Joe Riccardi <riccardi@ecohealthalliance.org <mailto:riccardi@ecohealthalliance.org> < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > >

Dear (b)(6)

Please find attached seven files:

1) FRBAA14-6-2-0471_Clarifications_FINAL.xlsx
2) EHA Budget Justification_FINAL.docx
3) EHA Documentation_FINAL.pdf
4) Human Link Budget Justification_FINAL.docx
5) Human Link Documentation_FINAL.pdf
6) JUST Budget Justification_FINAL.docx
7) JUST Documentation_FINAL.pdf

There are three sets of paired files with the requested documentation (PDFs) and track-change budget justifications (MS Word) for EcoHealth Alliance and our two subcontracts under this proposal. We have also included the clarifications (MS Excel) with responses to the specific questions in each tab.

Please let me know, if there are additional questions or any other documentation is required.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 < tel:1.212.380.4469 > > (office)
(b)(6)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-http://www.ecohealthalliance.org/ < caution-Caution-http://www.ecohealthalliance.org/ > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

From: (b)(6)
To: "William B. Karesh"; "Aleksei Chmura"
Cc: (b)(6)
Subject: Jordan Award
Date: Tuesday, September 29, 2020 4:22:00 PM
Attachments: Terms and Conditions (DTRA-specific) 14Sep2020 FINAL.pdf
HDTRA1-20-1-0029 Award.pdf
EHA Jordan SOW.pdf

Attached you will find the award documentation for grant HDTRA1-20-1-0029: Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity. Please confirm once you have received this email, thank you.

V/r

(b)(6) Contractor

Contract Specialist ▪ Broadleaf

Defense Threat Reduction Agency (DTRA)

Office Phone: (b)(6)

(b)(6)

DEFENSE THREAT REDUCTION AGENCY (DTRA)
GENERAL TERMS AND CONDITIONS FOR GRANT AWARDS

Table of Contents

1. Terms and Conditions Incorporated by Reference.

The DoD Research and Development General Terms and Conditions, most current version as of the date of grant award, are hereby incorporated by reference and are available for download at website http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions.aspx.

2. Acceptance of Grant.

The recipient is not required to countersign the Grant document; however, the recipient agrees to the conditions specified in the Research Grant and the Articles contained herein unless notice of disagreement is furnished to the Grants Officer within fifteen (15) calendar days after the date of the Grants Officer's signature. In case of disagreement, the recipient shall not assess the Grant any costs of the research unless and until such disagreement(s) is resolved.

3. Recipient Responsibilities.

The recipient will bear primary responsibility for the conduct of the research and will exercise judgment towards attaining the stated research objectives within the limits of the Grant's Terms and Conditions.

The Principal Investigator(s) (PI) specified in the Grant award will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The PI, operating within the policies of the recipient, is in the best position to determine the means by which the research may be conducted most effectively.

4. Standards for Financial Management Systems.

Where the Federal Government guarantees or insures the repayment of money borrowed by the recipient, DTRA, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the recipient are not deemed adequate to protect the interest of the Federal Government.

DTRA may require adequate fidelity bond coverage where the recipient lacks sufficient coverage to protect the Federal Government's interest.

Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties, as prescribed in 31 CFR Part 223, "Surety Companies Doing Business with the United States."

5. Modification of the Grant.

The only method by which this Grant may be modified is by a formal, written modification signed by the Grants Officer. No other communications, whether oral or in writing, are valid.

Prior Approvals are required as follows:

1) Expenditures on equipment costing $5,000 or more not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)
2) Expenditures for foreign travel not specifically identified in the budget at time of award. (Approval via written notification from the Grants Officer.)

3) Prior approval is not required to transfer amounts budgeted for indirect costs to absorb increases in direct costs, or vice versa.
4) Prior approval is not required to carry forward an unobligated balance to a subsequent period of performance under this award.

6. Payments.

The 2 CFR 200 governs responsibilities concerning payments, with the following clarifications:

Recipients shall submit requests for payment using Invoicing, Receipt, Acceptance, and Property Transfer (iRAPT) at https://wawf.eb.mil/. Any request for advance payments must be approved by the Administrative Grants Office shown in Block 6 of the award. The request shall be submitted to the Administrative Office identified in Block 6 of the Research Grant by entering the following routing codes:

1) *Pay Office DoDAAC*: See Block 12 (Code) on the first page of the Grant.
2) *Invoice Type*: Non Procurement Instrument (NPI) Voucher.
3) *Issue By DoDAAC*: See Block 5 (Code) on the first page of the Grant.
4) *Admin DoDAAC*: See Block 6 (Code) on the first page of the Grant.
5) *Grant Approver*: Same as Admin DoDAAC (Leave Ext. blank).

Payments will be made by the Defense Finance and Accounting Service (DFAS) office specified in the Research Grant (Block 12).

A foreign awardee must have a U.S. bank account and be signed up for electronic payments (electronic funds transfers (EFT)).

7. Funding Increments and/or Options.

The recipient is advised that the Grantor's obligation to provide funding for increments and/or options included in the Grant is contingent upon satisfactory performance in the judgment of the DTRA Scientific Officer/Technical Monitor and the availability of funds. Other factors will be considered before options will be exercised (for example, expenditure rate and current programmatic objectives). Accordingly, no legal liability on the part of the Grantor exists unless or until funds are made available to the Grantor and notice of such availability is confirmed in writing to the recipient. Refer to the Funding Profile in Section G of the Grant for additional incremental funding planned, but not currently obligated for the Grant.

Funding Increments – In no event is the Government obligated to reimburse the recipient for expenditures in excess of the total funds allotted by the Government to this agreement. Recipients should note that low expenditure rates reported on payment requests may be cause for deferral of future increments. The Government anticipates unilateral modifications for funding increments.

Options – If the agreement contains Option(s), the Government reserves the right to exercise the Option(s) unilaterally.

8. Patent Rights.

Patent Rights are governed by 37 CFR 401.14 with the following clarifications: All DTRA-related disclosures, confirmatory licenses to the government, patent applications, and other communications should be submitted using iEdison (https://public.era.nih.gov/iedison), a single web interface for government grantees to report details of inventions and patents. .

The 37 CFR Part 401 invention reporting requirements are summarized at iEdison (https://era.nih.gov/iedison/invention_timeline.htm). If the grantee organization is not already an iEdison registrant, then iEdison registration is required prior to submission of the below invention reports. The grant shall not be closed out until all invention reporting requirements are met.

The recipient shall also submit interim and final Reports of Inventions using the DD882 form (https://www.arl.army.mil/www/pages/218/d882.pdf). Interim invention reports shall be submitted annually, listing subject inventions reported during that period or that there are no such inventions. These reports are due no later than 1 July of each year. Grants effective after 31 January will not require a report until 1 July the following year. A final report shall be submitted within ninety (90) days after end of the project, listing all subject inventions or stating that there were no such inventions. These Reports of Inventions should be submitted to:

1) The DTRA Grants Officer via email (the address specified in the grant's clause 252.601-9000 may be used);
2) The Administrative Officer listed in the Grant via email (Block 6 of the SF-26 award or Block 7 of the SF-30 modification);
3) As directed by DTRA, email or portal; and
4) E-mailed to dtrabasicresearch@mail.mil (file size must be less than 10MB). File should be named by the Grant number and "Invention Report" (e.g. HDTRA1-12-1-9999 Invention Report).

9. Technical Reporting Requirements.

Research Performance Progress Report (RPPR). Except under rare cases, RPPRs are required annually. The RPPR is due no later than 1 July of each year. Grants effective after 31 January will not require a RPPR until 1 July of the following year.

The RPPR is *not* a cumulative report. The first RPPR shall only include actions that occurred from the Period of Performance start date up to submission of the first RPPR. Each subsequent report shall only include actions that occurred during the 12-month period following the previous year's RPPR.

A RPPR is not required in the final year of the award if the period of performance ends within 60 days of the RPPR due date. In this instance the Final Report will satisfy the requirement. Broadly the RPPR shall address the following items:

- Accomplishments
- Products
- Participants and Other Collaborating Organizations

- Impact
- Changes/Problems

Templates and specific instructions will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). A copy of the RPPR should also be provided to the Administrative Office identified in the Grant. The file names should be as follows:

- RPPR: Year Annual Report Grant Number, e.g. 2017 Annual Report HDTRA1-12-1-9999.
- Metrics: Year Metrics Grant Number, e.g. 2017 Metrics HDTRA1-12-1-9999.

Quad Chart. An updated quad chart must be submitted annually. A template will be provided each year in advance of the submission deadline. All files must be submitted via email to dtrabasicresearch@mail.mil (individual file size must be less than 10MB). The file name should be as follows:

- Quad Chart: Year Quad Chart Grant Number, e.g. 2017 Quad Chart HDTRA1-12-1-9999.

Annual Technical Review. At least one representative (preferably the PI) for each award is expected to attend and present at an annual technical program review meeting, unless otherwise exempted by DTRA in writing. For planning purposes reviews will typically be for two days in Northern Virginia during the spring or summer months.

Final Technical Report. A comprehensive final technical report is required: the draft document is required forty-five (45) days prior to the end of the Period of Performance and the final document is required ninety (90) days after the expiration or termination of the award.

The purpose of the final report is to document and to transition the results of the effort into the DTRA and DoD applied research community. The final report will always be sent to the Defense Technical Information Center (DTIC) and unclassified reports may be made available to the public through the National Technical Information Service (NTIS).

The final report is more than an extension of previous annual reports. The final report shall be a **comprehensive** technical summary of the significant work accomplished. The final report, where it is not readily accessible in published form should, where applicable:

- Clearly describe and illustrate the experimental equipment, setup, and procedures;
- Characterize and tabulate collected/computed data in an appendix;
- Sufficiently describe computational codes so they can be reproduced. Include a listing of the code in an appendix if possible and appropriate; and
- When the research effort culminates in the production of one or more student theses or dissertations, in these cases, the most significant advancements and conclusions (equations, figures, relationships, etc.) should be included in an executive summary. The theses or dissertations should be attached as appendices only if they are not readily available. If they are, clearly reference them and how they can be obtained. Also include in the executive summary, cumulative lists of people involved in, and publications

stemming from, the research effort. Do not include copies of already submitted or published articles in the final report.

Standard Form (SF) 298, Report Documentation Page, must be used. Item 13 of the SF-298 should contain a 100 to 200 word abstract summarizing technical progress during the reporting period. The SF-298 may be found on the Internet at: http://www.gsa.gov/portal/forms/download/116146

All of the report pages should be prepared for acquisition and distribution by DTIC. All of the report pages should be of good quality for copying purposes. No pages should be missing.

The format and standard required by your institution for the preparation of theses and dissertations shall be used for the final report. In the absence of any institutional standards, you may wish to refer to the American National Standards Institute (ANSI) document Z39.18-1987, "Scientific and Technical Reports: Organization, Preparation, and Production," for guidance. The report may be obtained from:

American National Standards Institute, Inc.
1430 Broadway
New York, NY 10018

It is anticipated that all final technical reports will be unclassified and that distribution will not be limited. However, for final technical reports that require a limited distribution as deemed necessary by DTRA, a Distribution List will be provided with the comments on the draft final technical report. The Distribution List should be formatted to match the rest of the report, placed at the end of the report, and added to the Table of Contents. The number of pages in the Distribution List should be added to the total page count and included in the total number of pages cited in Block 15 of the SF-298.

The draft of the final technical report will be due not later than forty-five (45) days prior to the end of the period of performance. The draft of the final technical report (including a draft SF-298) must be submitted electronically as follows:

- Email the draft of the final technical report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Draft Final Report' and the Grant number, e.g. Draft Final Report HDTRA1-12-1-9999.
- Provide a copy of the report to the Administrative Office identified in the Grant.

Within thirty (30) days, this draft will be reviewed by DTRA and comments will be provided to the Grantee to ensure the report complies with DTRA final report requirements. Such review and comment does not restrict the conduct or reporting of the project research findings/outcomes and, in accordance with Article 35, does not restrict Grantee's ability to publish. Grantee shall incorporate such requested changes so that the report incorporates and complies with agreement final reporting requirements terms. Final Technical Reports are due ninety (90) days after the expiration or termination of the award. The final submission should be made in accordance with the draft final report submission instructions.

Final Metrics. A final metrics table (in MS Excel format) is required. A template and specific instructions will be provided in advance of the submission deadline. The final metrics file should be submitted along with the Final Technical Report. The fields contained

in the final metrics file are analogous to those of the annual submissions. The final metrics file shall contain only data from the last annual reporting period until the end of the award's funded Period of Performance.

- Email the final Metrics File to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be 'Final Metrics' and the Grant number, e.g. Final Metrics HDTRA1-12-1-9999.

10. Financial Reporting Requirements.

Federal Financial Reports (SF-425) are due no later than 1 July of each year with data "as of" 30 May of that year. Grants effective after 31 January will not require a Federal Financial Report until 1 July of the following year. All financial reports shall be submitted to the Administration Office identified in Block 6 of the Research Grant. In addition, the Federal Financial Report must be submitted electronically as follows:

- Email the Federal Financial Report to dtrabasicresearch@mail.mil (file size must be less than 10MB). The file name should be the Year, 'Federal Financial Report' and the Grant number, e.g. 2015 Federal Financial Report HDTRA1-12-1-9999.

11. Delegation of Administration Duties.

Certain grant administration duties have been delegated to the Administration Office identified in Block 6 of the Research Grant. These duties are as follows:

1) Provisionally approve all Grant and Cooperative Agreement Vouchers.
2) Perform all property administration services except the approval of recipient's requests to purchase equipment with grant funds. Such approvals must be granted by the DTRA Grants Officer.
3) Perform all plant clearance functions.
4) Approve requests for Registration for Scientific and Technical Information Services (DD Form 1540).
5) Obtain all financial report(s) (see Article 10 of this document).
6) Execute administrative closeout procedures, which include the following:
   a. Obtain the final Report of Inventions and Subcontracts (DD Form 882).
   b. Obtain final payment request, if any.
   c. Obtain final property report and dispose of purchased property and government furnished equipment (GFE) in accordance with the DoDGARs Part 22, Subpart G.
   d. Perform a review of final incurred costs and assist the Grants Officer in resolving exceptions, if any, resulting from questioned costs.
   e. Assure that all refunds due the Government are received by the Grantor.

NOTE: This term and condition is **not applicable** to instrumentation and equipment grant awards.

12. Security.

As a general rule, PI's will not need access to classified security information in the conduct of research supported under this Grant. Should it appear that access to such information is desirable the recipient shall advise the Grantor and request clearance for the investigator. Should information be developed during the course of work under this Grant that, in the

judgment of the PI or the recipient, should be classified, the Grants Officer shall be notified immediately.

13. Representations and Assurances.

By accepting funds under this Grant, the recipient assures that it will comply with applicable provisions of the national policies and statutory/regulatory/executive-based requirements detailed below.

LIVE ORGANISMS. By signing this agreement or accepting funds under this agreement, the recipient assures that it will comply with applicable provisions of the following national policies concerning live organisms:

1) For human subjects:

   a) Adhere to the requirements for protection of human subjects per the DoD level terms and conditions as well as the following DTRA requirements:
   b) The recipient shall adhere to DTRA local clause 252.223-9002 – Protection of Human Subjects (Aug 2010). The full text of this clause is as follows:

      All research under this grant involving human subjects must be conducted in accordance with 32 CFR 219, 10 U.S.C 980, and DoDD 3216.02, as well as other applicable federal and state regulations. Grantees must be cognizant of and abide by the additional restrictions and limitations imposed on the DoD regarding research involving human subjects, specifically as regards vulnerable populations (32 CFR 219 modifications to subparts B-D of 45 CFR 46), recruitment of military research subjects (32 CFR 219), and surrogate consent (10 U.S.C. 980).

      DTRA Directive 3216.01 of June 9, 2010 establishes the DTRA Human Subjects Protection Program, sets forth the policies, defines the applicable terms, and delineates the procedures necessary to ensure DTRA compliance with federal and DoD regulations and legislation governing human subject research. The regulations mandate that all DoD activities, components, and agencies protect the rights and welfare of human subjects of study in DoD-supported research, development, test and evaluation, and related activities hereafter referred to as "research". The requirement to comply with the regulations applies to new starts and to continuing research.

      The DTRA directive requires that research using human subjects may not begin or continue until the Defense Threat Reduction Agency's Research Oversight Board (ROB) has reviewed and approved the proposed protocol. Grantees and subcontractors are required to submit a valid federal assurance for their organization (institution, laboratory, facility) that has been issued by either DoD or the Department of Health and Human Services, and documentation of review of proposed protocols by the local Institutional Review Board (IRB) to include consent forms for any planned research using human subjects to the DTRA ROB for its review through the Grants Officer's representative (if assigned) or the Grants Officer. The ROB review is separate from, and in addition to, local IRB review.

      A study is considered to involve human research subjects if: 1) there is interaction with the subject (simply talking to the subject qualifies; no needles are required); and

2) if the study involves collection and/or analysis of personal/private information about an individual, or if material used in the study contains links to such information.

Written approval to begin research or subcontract for the use of human subjects under the proposed protocol will be provided in writing from the DTRA ROB, through the Grants Officer. A copy of this approval shall be maintained by both the Grantee and the government. Any proposed modifications or amendments to the approved protocol or consent forms must be submitted to the local IRB and the DTRA ROB for review and approval. Examples of modifications/ amendments to the protocol include but are not limited to:

- a change of the PI;
- changes in duration or intensity of exposure to some stimulus or agent;
- changes in the information requested of volunteers, or changes to the use of specimens or data collected; or
- changes in perceived or measured risks or benefits to volunteers that require changes to the study.

Research pursuant to such modifications or amendments shall not be initiated without IRB and ROB approval except when necessary to eliminate apparent and immediate hazards to the subject(s).

Research projects lasting more than one year require IRB review at least annually, or more frequently as required by the responsible IRB. ROB review and approval is required annually. The Grantee or subcontractor must provide documentation of continued IRB review of protocols for ROB review and approval in accordance with these Terms and Conditions. Research must not continue without renewed ROB approval unless necessary to eliminate apparent and immediate hazards to the subject(s).

Non-compliance with any provision of this clause may result in withholding of payments under the grant pursuant to the grant's payments clause(s) and/or grant termination pursuant to the grant's termination clause(s). The government shall not be responsible for any costs incurred for research involving human subjects prior to protocol approval by the ROB.

2) For animals:

a. Adhere to the requirements for protection of animal subjects per the DoD level terms and conditions as well as the following DTRA requirements:

b. DTRA local clause 252.235-9001 – Prohibition of Use of Laboratory Animals (Jul 2010). The full text of this clause is as follows:

The grant recipient shall obtain approval from the US Army Medical Research and Material Command (MRMC), Animal Care and Use Review Office (ACURO) prior to conducting research on live nonhuman vertebrates. Studies involving non-human primates, dogs, cats, or marine mammals will require a site visit by an ACURO laboratory animal veterinarian as a condition of approval. DoD may also conduct site visits involving research on other animals when deemed appropriate. The animal

research facility is responsible for notifying the DoD sponsor if Association for the Assessment and Accreditation of Laboratory Animal Care accreditation is lost or the facility is under USDA inspection. DoD also has the right to a site inspection under these circumstances.

The grant recipient (including subcontractors) is expressly forbidden to use laboratory animals in any manner whatsoever without the express written approval of MRMC ACURO.

The grant recipient shall complete the ACURO Animal Use Appendix for Research Involving Animals found at the following web site: http://mrmc.amedd.army.mil/index.cfm?pageid=research_protections.acuro_animalappendix. Submit the completed ACURO appendix, contact information, the DTRA grant number and a copy of the grant for processing to the email address listed at the ACURO website. Once ACURO approves the effort, the grant recipient will receive written approval to begin animal use from the US Army MRMC ACURO by separate email. The grant recipient shall promptly provide a copy of the approval to the Grants Officer and Grants Officer representative. After approval, changes or protocol amendments must be submitted to and approved by ACURO before implementation.

The grant recipient, or subcontractors as appropriate, shall submit the most recent U.S. Department of Agriculture Animal Care Inspection Report annually in accordance with instructions provided.

Non-compliance with any provision of this clause may result in termination of the grant.

DoD Instruction 3216.01, dated September 13, 2010, provides policy and requirements for the use of animals in DoD-funded research based on Army Regulation 40-33. The DoD definition of animal is any live nonhuman vertebrate. All proposals that involve the use of animals must be in compliance with DoD Instruction 3216.01 and AR 40-33. DTRA requires that research using animals not begin or continue until the ACURO has reviewed and approved the proposed animal use. For animals, the provisions include rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Action of 1966 (U.S.C. 2131-2156); and (ii) the "Guide for the Care and Use of Laboratory Animals," National Institutes of Health Publication No. 86-23

RESEARCH INVOLVING RECOMBINANT DNA MOLECULES. Any recipient performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," July 5, 1994 (59 FR34496) amended August 5, 1994 (59 FR40170) amended April 27, 1995 (60 FR 20726), or such later revision of those guidelines as may be published in the Federal Register.

COMBATING TRAFFICKING IN PERSONS. The recipient agrees to comply with the trafficking in persons requirement in Section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)) as implemented by 2 CFR 175.

1) Provisions applicable to a recipient that is a private entity.

   a. You as the recipient, your employees, sub-recipients under this award, and sub-recipients' employees may not—
      - Engage in severe forms of trafficking in persons during the period of time that the award is in effect;
      - Procure a commercial sex act during the period of time that the award is in effect; or
      - Use forced labor in the performance of the award or subawards under the award.

   b. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a sub-recipient that is a private entity—
      - Is determined to have violated a prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph 1)a. of this award term through conduct that is either—
        - Associated with performance under this award; or
        - Imputed to you or the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

2) Provision applicable to a recipient other than a private entity.

   a. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a sub-recipient that is a private entity—
      - Is determined to have violated an applicable prohibition in paragraph 1)a. of this award term; or
      - Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph 1)a. of this award term through conduct that is either—
        - Associated with performance under this award; or
        - Imputed to the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR Part 180, "OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement)," as implemented by our agency at 2 CFR Part 376.

3) Provisions applicable to any recipient.

   a. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph 1)a. of this award term.

   b. Our right to terminate unilaterally that is described in paragraph 1)b. or 2)a. of this Article:
      - Implements Section 106(g) of the TVPA, as amended (22 U.S.C. 7104(g)), and

- Is in addition to all other remedies for noncompliance that are available to us under this award.

c. You must include the requirements of paragraph 1)a. of this award term in any subaward you make to a private entity.

4) Definitions. For purposes of this award term:

a. "Employee" means either:
- An individual employed by you or a sub-recipient who is engaged in the performance of the project or program under this award; or
- Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

b. "Forced labor" means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

c. "Private entity":
- Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.
- Includes:
  - A non-profit organization, including any non-profit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
  - A for-profit organization.

d. "Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at Section 103 of the TVPA, as amended (22 U.S.C. 7102).

PROHIBITION ON USING FUNDS UNDER GRANTS AND COOPERATIVE AGREEMENTS WITH ENTITIES THAT REQUIRE CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS. The recipient agrees to comply with the requirements in section 743 of the Financial Services and General Government Appropriations Act, 2015 (Division E of the Consolidated and Further Continuing Appropriations Act, 2015, Pub. L. 113-235):

1) The recipient may not require its employees, contractors, or sub-recipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

2) The recipient must notify its employees, contractors, or sub-recipients that the prohibitions and restrictions of any internal confidentiality agreements inconsistent with paragraph 1) of this award provision are no longer in effect.

3) The prohibition in paragraph 1) of this award provision does not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

4) If the Government determines that the recipient is not in compliance with this award provision, it:

    a. Will prohibit the recipient's use of funds under this award, in accordance with section 743 of Division E of the Consolidated and Further Continuing Resolution Appropriations Act, 2015, (Pub. L. 113-235) or any successor provision of law; and

    b. May pursue other remedies available for the recipient's material failure to comply with award terms and conditions.

14. Data Collection.

Data collection activities, if any, performed under this Grant are the responsibility of the recipient. Awarding agency support of the project does not constitute approval of the survey design, questionnaire content, or data collection procedures. The recipient shall not represent to respondents that such data are being collected for or in association with the awarding agency without the specific written approval of the cognizant awarding agency official. However, this requirement is not intended to preclude mention of the awarding agency support of the project in response to an inquiry or acknowledgment of such support in any publication of this data.

15. Publications and Acknowledgement of Sponsorship.

Publication of results of the research project in an appropriate professional journal is encouraged as an important method of recording and reporting scientific information. .

The recipient agrees that in the release of information relating to the grant, such release shall include the following statement, "The project or effort depicted was or is sponsored by the Department of the Defense, Defense Threat Reduction Agency. The content of the information does not necessarily reflect the position or the policy of the federal government, and no official endorsement should be inferred." For purposes of this provision, information includes news releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, symposia, etc.

When issuing statements, press releases, requests for proposals, bid solicitations, and other documents describing projects or programs funded in whole or in part with federal money, all recipients receiving federal funds, shall clearly state: (i) the percentage of total costs of the program or project which will be financed with federal money, and (ii) the dollar amount of federal funds for the project or program.

16. Authorization to Perform Activities Abroad.

If the award recipient is a foreign institution, the recipient assures that it has been duly authorized to operate and do business in the country or countries in which the grant is to be performed; that it has obtained all appropriate licenses, permits, and approvals required in connection with the grant's proposed activities; and that it will fully comply with all the laws,

decrees, labor standards and regulations of such country or countries during the performance of the grant. U.S. Government funds may not be used in support of a project which is prohibited by law in the country or countries in which it is undertaken. DTRA does not assume responsibility for the recipient's compliance with the laws and regulations of the country or countries in which the activities are to be conducted.

17. Inconsistency between English Version and Translation of Grant.

The foreign recipient shall ensure that all contract correspondence that is addressed to the U.S. Government is submitted in English or with an English translation. In the event of inconsistency between the terms of the grant and any translation thereof into another language, the meaning in the English language shall control.

18. Value Added Tax (VAT) and Other Taxes

During implementation of grant activities, the recipient will notify DTRA as soon as they become aware of any VAT or other taxes, exceeding $500.00 per transaction, not identified in the grant proposal and outside those considered VAT costs associated with travel, including and limited to lodging, meals, and transportation. A "transaction" is defined as a single purchase by the recipient and transactions may not be deliberately split in order to avoid compliance with the $500.00 limit. DTRA approval in writing with documentation of extraordinary circumstances is required prior to the recipient using any DTRA funds for VAT or other taxes exceeding $500.00 per transaction, and a grant modification may be required. The recipient understands that in the event that DTRA is unable to secure approval to use DTRA funds for VAT or other taxes exceeding $500.00 per transaction, the purchase of applicable items may not proceed. For those instances where the recipient has received written approval to use DTRA funds to pay VAT or other taxes on any item(s) exceeding $500.00 per transaction, the recipient will include this information in its financial reports (e.g., SF 425) to DTRA.

19. Prohibition on the Use of Cooperative Threat Reduction Funds in the Russian Federation

Recipients of grants or cooperative agreements in Thrust Area 6 are prohibited from using DTRA funds for activities in the Russian Federation.

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES
		1 | 10

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
HDTRA12010029	29 Sep 2020	

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
DEFENSE THREAT REDUCTION AGENCY/AL-AC 8725 JOHN J. KINGMAN ROAD, MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	OFFICE OF NAVAL RESEARCH-BOSTON 495 SUMMER STREET, ROOM 627 BOSTON MA 02110-2109	N62879

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)	8. DELIVERY [ ] FOB ORIGIN [X] OTHER (See below)
ECOHEALTH ALLIANCE INC. MR. ALEKSEI CHMURA 460 W 34TH ST 17TH FL NEW YORK NY 10001-2317	9. DISCOUNT FOR PROMPT PAYMENT
	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: — ITEM
CODE 3MMU3 — FACILITY CODE	

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201	HDTRA1	DFAS COLUMBUS CENTER DFAS-CO/NORTH ENTITLEMENT OPERATIONS P.O. BOX 182317 COLUMBUS OH 43218-2317	HQ0337

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )	**See Schedule**

15A. ITEM NO.	15B. SUPPLIES/ SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	SEE SCHEDULE				

15G. TOTAL AMOUNT OF CONTRACT **$2,957,164.19**

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				**PART II - CONTRACT CLAUSES**	
X	A	SOLICITATION/ CONTRACT FORM			I	CONTRACT CLAUSES	
	B	SUPPLIES OR SERVICES AND PRICES/ COSTS				**PART III – LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.**	
	C	DESCRIPTION/ SPECS./ WORK STATEMENT			J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING				**PART IV - REPRESENTATIONS AND INSTRUCTIONS**	
	E	INSPECTION AND ACCEPTANCE			K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	F	DELIVERIES OR PERFORMANCE			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	G	CONTRACT ADMINISTRATION DATA			M	EVALUATION FACTORS FOR AWARD	
	H	SPECIAL CONTRACT REQUIREMENTS					

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. [ ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] SEALED-BID AWARD (Contractor is not required to sign this document.)
Your bid on Solicitation Number _____
including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the terms listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	(b)(6) / CONTRACTING OFFICER TEL: (b)(6) EMAIL: (b)(6)

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ (Signature of person authorized to sign)		(b)(6) BY _____ (Signature of Contracting Officer)	29-Sep-2020

Section B - Supplies or Services and Prices

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Lot	$2,957,164.19	$2,957,164.19

Years 1-3: FRBAA14-6-2-0471
FFP
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity. In accordance with the following attachements: SOW at attachment 1 dated 3/18/2020 and DTRA Terms and Conditions for Grant Awards dated 09/14/2020 at attachment 2
FOB: Destination
U009

NET AMT $2,957,164.19

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
000101					$0.00

Funding to support CLIN 0001
FFP

NET AMT $0.00

ACRN AA $2,956,308.78
CIN: HDTRA10361120001

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		1	Lot	$999,970.32	$999,970.32
OPTION	Year 4: FRBAB14-6-2-0471 FFP Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity. In accordance with the following attachements: SOW at attachment 1 dated 3/18/2020 and DTRA Terms and Conditions for Grant Awards dated 09/14/2020 at attachment 2 FOB: Destination U009				
				NET AMT	$999,970.32

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		1	Lot	$942,857.34	$942,857.34
OPTION	Year 5: FRBAA14-6-2-0471 FFP Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity. In accordance with the following attachements: SOW at attachment 1 dated 3/18/2020 and DTRA Terms and Conditions for Grant Awards dated 09/14/2020 at attachment 2 FOB: Destination U009				
				NET AMT	$942,857.34

Section C - Descriptions and Specifications

CLAUSES INCORPORATED BY FULL TEXT

252.601-9002 GRANT REFERENCE INFORMATION (MAY 2009)

a. This grant is awarded as a result of Broad Agency Announcement (BAA) **HDTRA1-11-16-BRCWMD-BAA**, Research and Development Enterprise, Basic and Applied Sciences Directorate, Basic Research for Combating Weapons of Mass Destruction (C-WMD).

b. **CFDA #:** 12.351

c. **Authority:** 10 U.S.C 2358 as amended.

(End of Clause)

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Destination	Government	Destination	Government
000101	N/A	N/A	N/A	N/A
0002	Destination	Government	Destination	Government
0003	Destination	Government	Destination	Government

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC / CAGE
0001	POP 29-SEP-2020 TO 28-SEP-2023	N/A	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
000101	N/A	N/A	N/A	N/A
0002	1 yr. AOE	1	DEFENSE THREAT REDUCTION AGENCY/CT-I (b)(6) 8725 JOHN J. KINGMAN ROAD MSC 6201 FORT BELVOIR VA 22060-6201 (b)(6) FOB: Destination	HDTRA1
0003	1 yr. AOE	1	(SAME AS PREVIOUS LOCATION) FOB: Destination	HDTRA1

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 044315 097 0134 000 N 20182020 D 34HQ 0901515BR_KD_BP_OT_18 1820_0134_34HQ_SCNCT DTRA 410
AMOUNT: $2,956,308.78

ACRN	CLIN/SLIN	CIN	AMOUNT
AA	000101	HDTRA10361120001	$2,956,308.78

CLAUSES INCORPORATED BY FULL TEXT

252.601-9000 GRANT POINTS OF CONTACT (MAY 2009)

a. Grant Specialist:
Name (b)(6)
Defense Threat Reduction Agency/AL-ACC
8725 John J. Kingman Road, MS 6201
Fort Belvoir, VA 22060-6201
Telephone (b)(6)
Email address: (b)(6)

b. Grantee Business Office:
Name: Dr. Aleksei Chmura
Title: Executive Organizational Representative
Phone: (212) 380 - 4473
E-mail: chmura@ecohealthalliance.org

c. Grantee Principal Investigator (PI):
Name: Dr. William Karesh
Title: Executive Vice President of Health and Policy
Phone: (212) 380 - 4463
E-mail: karesh@ecohealthalliance.org

(End of Clause)

252.601-9001 GRANTS OFFICER'S REPRESENTATIVE (GOR) (MAY 2009)

d. Grants Officer's Representative (GOR) for this Grant is:
Name: (b)(6)
Defense Threat Reduction Agency/BTRP
8725 John J. Kingman Road
Fort Belvoir, VA 22060-6201
telephone (b)(6)
email address: (b)(6)

b. SCOPE AND LIMITATIONS OF AUTHORITY FOR DTRA GRANTS OFFICER'S REPRESENTATIVE

1. The Grants Officer's Representative (GOR) is responsible for monitoring the technical and programmatic performance of the grant or cooperative agreement (hereinafter referred to as agreement) including compliance with the agreement's reporting requirements. Perceived deviations from the agreement's terms and conditions shall be brought to the attention of appropriate recipient personnel and if not corrected, to the attention of the Grants Officer. Deviations or other occurrences indicative of the recipient's inability or unwillingness to conform to the agreement's requirements shall be brought to the immediate attention of the Grants Officer.

2. The GOR has no authority to modify the stated terms of the agreement or specifications in any manner, or to approve any action that would result in additional charges to the Government. The DTRA Grants Officer must make all such changes in writing.

3. The GOR is authorized to correspond directly with the recipient on matters within the scope and limitations of his or her authority. All such correspondence shall be signed personally by the GOR and a copy will be furnished the Grants Officer for placement in the official agreement file.

4. The GOR will provide technical advice to the recipient to the extent such advice will not alter any of the agreement's terms and conditions or result in an increase in the estimated cost of the agreement's performance as specified in the agreement. The GOR is encouraged to discuss with the recipient new ideas related to the original scope of the agreement that may be of special interest to DTRA. The GOR should also be alert for indications that any part of the research is becoming unfruitful. If, as a result of such discussions, questions arise as to the possible need for a modification, the matter shall be brought to the immediate attention of the Grants Officer. The GOR shall not direct the recipient to undertake any action that the recipient believes to be contrary to the agreement's scope, terms or conditions without the written approval of the Grants Officer.

5. Any visits to the recipient's facilities on matters pertaining to the agreement will be documented in a brief memorandum. A copy will be provided the Grants Officer for placement in the official agreement file.

6. The GOR will maintain such work files as he or she deems necessary to properly document performance of the duties and responsibilities as a GOR. Upon completion of the agreement and delivery of all required reports, such work files will be forwarded to the Grants Officer for placement in the official agreement file.

7. In performance of the GOR's duties, the GOR shall constantly stress protection of the Government's interests. Similarly, the GOR shall avoid any act which may tend to compromise the position of DTRA, any individual member of DTRA or which will impact confidence in the integrity of DTRA with the business community.

(End of Clause)

FUNDING PROFILE:
The amount of $2,956,308.78 is obligated for work to be performed during the period beginning with grant award and continuing through September 28, 2023. Additional incremental funding planned, but not obligated, is:

FY 21 $855.41

The Government's liability is limited to the amount obligated

Invoice Schedule

1	9/29/2020	$79,900.24
2	10/29/2020	$79,900.24
3	11/29/2020	$79,900.24
4	12/29/2020	$79,900.24
5	1/29/2021	$79,900.24
6	2/28/2021	$79,900.24
7	3/29/2021	$79,900.24
8	4/29/2021	$79,900.24
9	5/29/2021	$79,900.24
10	6/29/2021	$79,900.24
11	7/29/2021	$79,900.24
12	8/29/2021	$79,900.24
13	9/29/2021	$79,900.24
14	10/29/2021	$79,900.24
15	11/29/2021	$79,900.24
16	12/29/2021	$79,900.24
17	1/29/2022	$79,900.24
18	2/28/2022	$79,900.24
19	3/29/2022	$79,900.24
20	4/29/2022	$79,900.24
21	5/29/2022	$79,900.24
22	6/29/2022	$79,900.24
23	7/29/2022	$79,900.24
24	8/29/2022	$79,900.24
25	9/29/2022	$79,900.24
26	10/29/2022	$79,900.24
27	11/29/2022	$79,900.24
28	12/29/2022	$79,900.24
29	1/29/2023	$79,900.24
30	2/28/2023	$79,900.24
31	3/29/2023	$79,900.24
32	4/29/2023	$79,900.24
33	5/29/2023	$79,900.24
34	6/29/2023	$79,900.24
35	7/29/2023	$79,900.24
36	8/29/2023	$79,900.24
37	9/28/2023	$79,900.14

(End of Clause)

Section J - List of Documents, Exhibits and Other Attachments

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	Statement of Work	7	18-MAR-2020
Attachment 2	Terms and Conditions	14	14-SEP-2020

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity/PI Karesh
Thrust Area 6 - CCWMD Research with Global Partners FRCWMD
Statement of Work

Project Title: Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity.

Document Date: 18 March 2020.

Objective: The objective of this grant is to reduce the threat of high-consequence zoonotic pathogens in Jordan and improve regional disease surveillance capacity. Jordan faces risk of several zoonoses of concern to human and animal health, including Middle East Respiratory Syndrome (MERS-CoV) and Avian Influenza (AI), with fundamental knowledge and capacity gaps around the distribution and determinants of zoonoses. Recent work by our team detected MERS-CoV in camels and people in Jordan, suggesting ongoing and unmitigated transmission risk of a priority pathogen. The proposed study will generate critical advances in determining the presence of zoonotic pathogens in the country and opportunities for public health intervention. Through a prospective human cohort study coordinated with animal sampling, we will conduct biological and behavioral surveillance in five regions of Jordan with livestock production interfaces to determine the presence and risk factors for MERS-CoV, AI, brucellosis, and leptospirosis to identify modifiable risk factors. By testing three core policy-relevant hypotheses and providing multi-disciplinary training opportunities, the awardee shall enhance scientific capacity in Jordan and support disease detection and reporting in Jordan, Iraq and Lebanon. Taking a coordinated, multi-hazard approach to threat reduction, the proposed study will add critical understanding of presence and risk factors for zoonotic diseases in Jordan and advance scientific capacity and application of the One Health concept to counter biothreats in the region.

Scope: The awardee proposes a five-year One Health study of zoonotic diseases in Jordan. The awardee team shall focus on the following major goals and milestones:

1) Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and poultry in Jordan: *Implement animal study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

2) Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses: *Implement human cohort study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

3) Characterize causal factors in animal-to-human transmission of these zoonoses: *Implement behavioral risk survey (Y1-OY1); Conduct epidemiological analyses (Y1-OY2)*

4) Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk: *Generate geospatial distribution and risk maps (Y1-OY2)*

5) Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon: *Host workshops (Y1-2, OY1-2); Submit reports and publications (Y1-OY2); Attend presentations/meetings (Y1-OY2)*

6) Identify specific modifiable risk factors for human infection with these zoonoses: *Conduct causal interference analyses (Y3-OY2); Policy recommendations on modifiable risk factors (Y3-OY2)*

This research will generate critical advances in detecting the presence of and exposure risk to high-consequence zoonotic viruses and bacteria across geographic regions and interfaces in Jordan, contributing to enhanced understanding of modifiable risk factors to inform government authorities on prevention activities to reduce disease threats.

Background: Jordan has experienced outbreaks of several high-consequence zoonotic diseases, including MERS-CoV and AI. Since its emergence in 2012, MERS-CoV has resulted in over 2,400 human cases globally and is recognized as a priority disease under the WHO R&D Blueprint. While the first human cases of MERS-CoV were traced back to Jordan, little is known about its underlying and ongoing risk of zoonotic disease in animal populations, particularly around primary transmission risk factors and pathways that precede spread in healthcare settings. MERS-CoV is one of several zoonoses posing threat to animal and human populations in the country. Highly Pathogenic Avian Influenza outbreaks, including subtype H5N1, have been reported, and brucellosis is considered endemic in Jordan, with recurring spillover but inadequate understanding of specific modes of transmission and poor vaccination coverage. While human cases of leptospirosis have not been reported in Jordan to date, high rates of certain Leptospira serovars have been detected in animals. Key questions and capacity gaps hinder understanding of the presence, distribution and risk factors in the country, leaving the country vulnerable to zoonotic biothreats, as well as wider regional gaps in detection and reporting. The threat of zoonotic disease is especially pertinent given the rapidly-growing poultry production industry in Jordan and camel, livestock, and poultry rearing in the region.

Jordan has recently made recent several notable scientific advances in detection of MERS-CoV, generating preliminary data that the proposed project will build on. While camels are the presumptive source of primary human MERS-CoV infections, the exact mechanisms of transmission and the possible role of other livestock species are unclear. Blood samples collected from camels and humans in the northern region of Jordan were positive for MERS-CoV, leading to the first-ever report of this disease to OIE in camels in Jordan in 2016. To date, only few countries have reported virus-positive MERS-CoV test results to the OIE so this is a significant and important step toward improving both MERS-CoV detection and reporting in the Middle East. Studies of zoonotic pathogens in the region to date have largely focused on single sites or interfaces, cross-sectional sampling events, or select taxonomic groups, limiting understanding of causal factors. Research is needed to monitor presence and transmission of zoonotic pathogens spatially, temporally, and by biohazard exposure (e.g. blood, urine, feces, and/or nasal secretions) and practices and conduct epidemiological analyses to identify modifiable risk factors for public health intervention. As a key area of stability in the region, it is crucial to support Jordan's biosurveillance capacity, enable understanding of baseline disease risk to allow differentiation of natural versus nefarious emergence events, and ensure responsible bio-risk management to ethically monitor and reduce disease threats. The country has also recently established a One Health platform that indicates the country's commitment to countering zoonotic disease threats. Given the volume of migration between Jordan and its neighbors, including in animal trade, regional coordination in disease monitoring and threat reduction is a critical component in effectively characterizing and addressing disease risk. This project seeks to fill current capacity gaps to advance Jordan as a leader in scientific research and zoonotic disease management and creating new capacity and scientific collaboration pathways for hypothesis-driven research and zoonotic disease monitoring and threat reduction in the region.

Key references include (additional references can be found in the Project Narrative):

van Doremalen N, Hijazeen ZS, Holloway P, Al Omari B, McDowell C, Adney D, Talafha HA, Guitian J, Steel J, Amarin N, Tibbo M, Abu-Basha E, Al-Majali AM, Munster VJ, Richt JA. High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan. *Vector Borne Zoonotic Dis*. 2017 Feb;17(2):155-159.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, Burbelo PD, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB, Lipkin WI. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. *MBio*. 2014 Feb 25;5(2):e00884-14.

World Health Organization. Joint External Evaluation of IHR Core Capacities of the Hashemite Kingdom of Jordan. Geneva. 2016.

Tasks/Scientific Goals: **(Format: Year #(s). Task #. Subtask#).**

TASK 1: Y1.1-O2.1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.

The awardee shall study presence of MERS-CoV, AI, Brucellosis and Leptospirosis in animals. Sites will be selected in five geographically-representative regions across Jordan: Northern Jordan (Al Ramtha), Middle Jordan (Al Zarqa), and Southern Jordan (Al Karak, Ma'an, and Aqaba). These regions were selected based on preliminary findings by our team and the presence of livestock production activities. Sites in each region shall reflect interfaces with poultry, camels, and other livestock animals are represented (e.g. farms or markets). The awardee shall receive permissions and approvals to work with animals prior to initiating sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 camels, poultry and other livestock quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Y1, Y3, and OY1 during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 animals. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, Brucellosis, and Leptospirosis. Staff training on proper study techniques (e.g. sampling, transport, and laboratory) will occur as detailed in Task 5. This task will contribute to testing the hypothesis that livestock species and poultry in Jordan show evidence of infection with MERS-CoV, AI, and/or other assayed zoonoses, as well as inform type of transmission pathways.

Y1.2.1 Identify sites for project study.

Y1.2.2 Obtain local permissions and approvals to work with animals.

Y1.2.3-O1.2.3 Conduct biological sampling in animals within the study area.

Y1.2.4-O2.2.4 Conduct PCR and/or serology testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 2: Y1.2- OY2.1: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses.

The awardee shall conduct a prospective cohort study of humans to evaluate behavioral and occupational risk factors for zoonotic infectious diseases (MERS-CoV, avian influenza, brucellosis, and leptospirosis) among persons living in Jordan in any of the five study regions. The study will enroll persons regularly working with livestock or poultry or sharing their living areas with these animals as well as persons unexposed to these factors. Sites will be selected as in Task 1 and in surrounding communities to enroll both exposed and unexposed populations. In Year 1, the awardee will receive local permissions and approvals to work with human subjects prior to initiating enrollment and sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 enrolled humans quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Year 1, Year 3, and Option Year 1

during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 humans. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, brucellosis, and leptospirosis (Years 1-4). Biological sampling will be paired with behavioral surveillance data as in Task 3.

Y1.2.1 Identify sites and conduct enrollment for human study component.

Y1.2.2 Obtain local permissions and approvals to work with human subjects.

Y1.2.3-O1.2.3 Conduct biological sampling (nasopharyngeal and oropharyngeal swabs, and/or blood) of in people within the study area.

Y1.2.4-O2.2.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 3: Y1.3-OY2.3: Characterize causal factors in animal-to-human transmission of these zoonoses.

The awardee shall monitor behaviors of persons enrolled in the prospective cohort study (as in Task 2) to identify and characterize causal factors for animal-to-human transmission of MERS-CoV, AI, brucellosis and leptospirosis. The PREDICT-2 Human Behavioral Risk Questionnaire will be augmented with animal-specific exposure frequency questions to collect demographic data, symptom and medical history data, social history data, and specific animal-related behaviors and practices that are possible risk factors for infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. The project team will administer the survey to enrolled participants at the first sampling visit (Year 1). During all future visits (Year 1- Option Year 1), enrolled participants will be administered a brief follow-up questionnaire designed primarily to capture time-varying exposure and covariate data. This longitudinal information will provide critical information about the context of exposures and pathways to link biological sampling and provide the wider context of practices and risk factors. Epidemiologic analysis of the questionnaire data (including time-varying data) in this Task will identify current practices and exposure pathways and initial modifiable risk factors. Specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) will be assessed under Task 6 for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. Results will be shared via annual reports and stakeholder meetings as in Task 5.

Y1.3.1 Obtain local permissions and approvals to work with human subjects.

Y1.3.2-O1.3.2 Conduct behavioral risk factor surveys in people.

Y1.3.3-O2.3.3 Analyze epidemiologic causal inference to identify modifiable risk factors.

TASK 4: Y1.4-OY2.4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.

The awardee shall map findings from Tasks 1-2 to show the distribution of detected pathogens across the regions and sampling sites. Geospatial mapping is a highly relevant visual tool to assist authorities in targeting surveillance and risk management activities. Using QGIS, laboratory results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and mapped to show the distribution of detected pathogens. Maps will be generated beginning Y1, Q3 when laboratory findings are available. Geospatial risk maps will be generated using statistical models to link human behavioral data to laboratory findings beginning in Y1, Q4. Geospatial maps will be updated quarterly and shared with USG/DTRA and Jordanian project partners. Training on geospatial analysis will be provided to project team

members and will be covered under a regional workshop to promote broader uptake of geospatial mapping as a low-cost tool to enhance disease monitoring programs in the region (Task 5).

Y1.4.1-O2.4.1 Generate maps of laboratory results

Y2.4.2-O2.4.2 Generate risk maps of human behavioral risk data

TASK 5: Y1.5-OY2.5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.

Strengthening disease detection and reporting capacity is a key contributor to health security and the ability to target risk factors for threat reduction. The project team is committed to improving this capacity in Jordan as well as more widely in the region through involvement of scientists and government officials in Iraq and Lebanon. We will train local staff in proper techniques for all project activities (Year 1 and Option Year 1). Each year we will support four students from medical and veterinary disciplines in Jordan to participate in training, field activities, project analyses and workshops to provide scientific mentorship and promote the One Health concept. Jordanian scientists and students will also be trained in laboratory techniques to be deployed in Jordan by the Human Link laboratory consultant that has led capacity development for MERS-CoV diagnostics in other countries. The awardee shall organize workshops in Jordan open to scientists from the Ministries of Health and Agriculture from Jordan, Iraq, and Lebanon (Years 1-2, Option Years 1-2). A secure project database will be developed for use in the epidemiological analyses. The awardee shall provide submission of annual sample repository information using a DTRA-specified format and shall grant access to all samples collected and data generated during the course of the project, up to and including at least 12 months after the project end date. The awardee shall conduct presentations/meetings at times and places specified in the grant schedule (Year 1 Task 5), including the DTRA Annual Technical Review. In Year 1 the awardee shall hold a kick-off meeting to introduce the project objectives and promote buy-in in study findings and capacity sustainment. Annual reports and stakeholder meetings and scientific presentations and publications will be used to disseminate results. The project will reinforce Jordan's national One Health platform, promoting the One Health concept for multiple diseases of concern for public and animal health and advancing capacity for hypothesis-driven research with direct application for policy decisions for threat reduction.

Y1.5.1 Conduct project kick-off meeting in Amman with local stakeholders.

Y1.5.2 & O1.5.2 Train local project staff in proper techniques.

Y1.5.3-O2.5.3 Host annual partners and stakeholders meeting.

Y1.5.4-O2.5.4 Complete annual report and share with project partners and local stakeholders.

Y1.5.5-Y2.5.5 & O1.5.5-O2.5.5 Conduct local/regional training workshops.

Y1.5.6- O2.5.6 Data management.

Y1.5.7- O2.5.7 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

TASK 6: Y3.6-OY2.6: Identify specific modifiable risk factors for human infection with these zoonoses.

The awardee shall integrate the findings of the biological testing (animal and human) and behavioral surveys in Tasks 1-3, assessing specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions)

for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. These potential modifiable risk factors will be determined through epidemiologic analysis of the questionnaire data (including time-varying data) paired with individual laboratory results (e.g., detection of viral RNA, bacterial DNA, or antibodies). Using quarterly, longitudinal data collected in Tasks 1-3, we will examine any major temporal dynamics that may be associated with elevated transmission risk (e.g. seasonality, animal birthing periods). Causal inference techniques within the potential outcomes framework will be employed to solidify statistical associations as concretized biological/clinical/environmental pathways by operationalizing exposures as well-defined interventions and ensuring exchangeability is maintained through confounder control informed by directed acyclic graphs of the conceptual exposure-disease pathways. The awardee will examine multiple zoonotic pathogens (as above) to inform general threat reduction guidelines. Identification of modifiable risk factors will inform intervention development that may interrupt future zoonotic transmission of the four pathogens in this study. Findings will be shared with USG/DTRA and the Jordanian Ministry partners at the annual stakeholders meetings, the threat reduction workshop, scientific presentations and publications as specified in Task 5. This information will provide a strong basis for potential policy guidance and the generation of solutions at the threat reduction workshop in OY2.

Y3.6.1-O2.6.1 Conduct causal inference analyses bases on Tasks 1, 2, 3.

Y3.6.2-O2.6.2 Share results of analyses at annual partners and stakeholders meeting.

Y3.6.3 & O2.6.3 Submit written report to DTRA and local partners and stakeholders.

Performance Schedule:

Task	Year 1	Year 2	Year 3	OY 1	OY 2
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan					
1.1. Identify sites for project study					
1.2 Obtain local permissions and approvals to work with animals					
1.3 Conduct biological sampling in animals within the study area					
1.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection					
2.1 Identify sites and conduct enrollment for human study component					
2.2 Obtain local permissions and approvals to work with human subjects					
2.3 Conduct biological sampling					
2.4 Conduct testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses					
3.1 Obtain local permissions and approvals to work with human subjects					
3.2 Conduct behavioral risk factor surveys in people					
3.3 Analyze epi causal inference to identify modifiable risk factors					
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk					
4.1 Generate maps of laboratory results					
4.2 Generate risk maps with human beh. risk data					
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon					
5.1 Conduct project kick-off meeting in Amman with local stakeholders					
5.2 Train local project staff in proper techniques					
5.3 Host annual partners and stakeholders meeting					
5.4 Complete annual report and share with partners and stakeholders					
5.5 Conduct local/regional training workshops					
5.6 Data management					
5.7 Conduct presentations/meetings at times and places specified					
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses					
6.1 Conduct causal inference analyses based on Task 1, 2, 3					
6.2 Share results of analyses at annual partners and stakeholders meeting					
6.3 Submit written report to DTRA and local partners and stakeholders					

Cover Sheet

Proposal Number	FRBAA14-6-2-0471
Phase I Proposal Number	
Topic	Thrust Area 6
Proposal Title	Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 W 34 St 17th Floor
Tax ID	311726494	**City**	New York
DUNS	0770900660000	**State/Province**	NY
CAGE		**Zip**	10001 - 2320
Website		**Country**	USA
POC Name	Dr. William Karesh	**POC Email**	karesh@ecohealthalliance.org

Cost

Applicant Certification

Organization Type	Non-Profit Organization
Are Human Subjects involved?	No
Are Vertebrate Animals involved?	No
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	No

Agency 1	**Contract/Grant No.**
Agency 2	**Contract/Grant No.**
Agency 3	**Contract/Grant No.**

Are you a current DoD Contractor or Grantee?	No

Agency	**Point Of Contact**
Phone #	

Principal Investigator 1

Prefix	Dr
Name	William Karesh
Title	Executive Vice President of Health and Policy
Address 1	460 W 34 St
Address 2	17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2320
Phone	212-380-4463 Ext
Fax	
Email	[redacted]

Business Official 1

Prefix	Dr
Name	Aleksei Chmura
Title	Authorized Organizational Representative
Address 1	460 W 34 St
Address 2	17th Floor
City	New York
State	NY
Country	USA
Zip	10001 - 2320
Phone	212-380-4473 Ext
Fax	
Email	[redacted]

For any purpose other than to evaluate the white paper proposal this data shall not be disclosed outside the Government and shall not be duplicated used or disclosed in whole or in part provided that if an award is made to the offeror as a result of or in connection with the submission of this data the Government shall have the right to duplicate use or disclose the data to the extent provided in the agreement This restriction does not limit the right of the Government to use information contained in the data if it is obtained from another source without restriction The data subject to this restriction is contained on the pages listed below

Proprietary Information (list page numbers)

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project.

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

This publicly releasable abstract is provided to DTRA for use in fulfillment of Section 8123 of the Defense Appropriations act and future versions of the same Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity In line with Thrust Area 6 - Cooperative Counter WMD Research with Global Partners FRCWMD we propose the first multi - disciplinary One Health research project to identify factors w hich allow or facilitate the transmission of Middle East Respiratory Syndrome Coronavirus (MERS - CoV) avian influenza (AI) and other infectious agents which spread from animals to humans in Jordan while simultaneously strengthening local capa bilities for prevention detection and reporting of these diseases in Jordan Iraq and Lebanon Little is known about the transmission routes of MERS - CoV AI and other key diseases at human - livestock/poultry interfaces in Jordan To fill this gap and contribute to biological threat reduction we have designed a hypothesis - driven One Health research project to characterize exposure risks for high consequence zoonotic diseases in Jordan using advanced epidemiological inference techniques and improv e diagnostic testing using methods that do not require manipulation or culturing of live viruses further reducing the risk of accidental laboratory outbreaks and access to pathogens that could be used as biological weapons This prospective cohort study involves interviews a nd longitudinal sampling of humans and opportunistic non - lethal sampling of livestock and poultry at animal markets and farms for MERS - CoV Brucella spp and Leptospira spp (humans-livestock) and for the full range of Influenza A found in humans and animals Under close supervision p artner laboratories in Jordan will screen for and characterize these pathogens C apacity - building cross - trainings on diagnostics epidemiology and risk reduction strategies will be conducted with visiting laboratory scien tists and government authorities from Iraq and Lebanon This multifaceted One Health app roach will advance scientific knowledge on the risk of MERS - CoV AI and other zoonoses in Jordan strengthen local zoonotic disease surveillance capabilities and enha nce scientific partnerships in Jordan Iraq and Lebanon to prevent detect and report MERS - CoV AI and other zoonotic threats

Knowingly and willfully making any false fictitious or fraudulent statements or representations may be a felony under the Federal Criminal False Statement Act (18 USC Sec 1001) punishable by a fine of up to $10 000 up to five years in prison or both

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity

Phase II Technical Proposal Text in blue indicates responses to reviewer comments.

I. ABSTRACT

In line with Thrust Area 6 - Cooperative Counter WMD Research with Global Partners FRCWMD, we propose a multi-disciplinary One Health research project to identify causal factors in the transmission of Middle East Respiratory Syndrome Coronavirus (MERS-CoV), avian influenza (AI), and other zoonoses from animals to humans in Jordan, while simultaneously strengthening local capacity for prevention, detection, and reporting of these zoonoses in Jordan, Iraq, and Lebanon. To contribute to biological threat reduction, we propose a hypothesis-driven One Health research project to characterize exposure risks for high consequence zoonotic diseases in Jordan using epidemiological causal inference techniques and improving serological testing using methods that do not require manipulation or culturing of live viruses. This prospective cohort study involves interviews and longitudinal sampling of humans and opportunistic non-lethal sampling of livestock and poultry at animal markets, and farms for MERS-CoV, *Brucella* spp., and *Leptospira* spp. (humans/livestock) and for AI subtypes (humans/poultry). Partner laboratories in Jordan will screen and characterize these zoonotic pathogens, and capacity-building cross-trainings will be conducted with visiting laboratory scientists from Iraq and Lebanon. This multifaceted One Health approach will advance scientific knowledge on the risk of MERS-CoV, AI, and other zoonoses in Jordan, strengthen local zoonotic disease surveillance capabilities, and enhance scientific partnerships in Jordan, Iraq and Lebanon to prevent, detect, and report biological threats.

II. SCOPE

A. Objective

Our primary research objectives are to characterize causal factors in animal-to-human transmission of MERS-CoV, AI, and other zoonoses in Jordan and to strengthen regional capacity for detection of these pathogens in order to reduce the threat of infectious diseases. Our proposed project will rigorously test the following initial hypotheses:

- **H_1.** Livestock species and poultry in Jordan show evidence of infection with MERS-CoV, AI, and/or other assayed zoonoses.
- **H_2.** Humans regularly exposed to livestock and/or poultry or their living areas have a greater risk of infection with MERS-CoV, AI, and/or other assayed zoonoses compared to other community members in Jordan.
- **H_3.** Some specific occupational practices that promote exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) pose a greater risk of infection with MERS-CoV, AI, and other assayed zoonoses compared to others.

Together, this research will generate critical advances in detecting the presence of and exposure risk to high-consequence zoonotic viruses and bacteria across geographic regions and interfaces, contributing to enhanced understanding of modifiable risk factors to inform government authorities on prevention activities to reduce disease threats.

B. Background

Jordan has experienced several important zoonotic diseases in the few past years including Influenza A (H1N1 pdm09) and MERS-CoV. Furthermore, an outbreak of H5N1 was reported in Jordan in 2006. A pandemic influenza surveillance plan that includes Severe Acute Respiratory

Infection and other influenza-like illnesses has been in written1 but needs capacity building to implement.

High-consequence zoonotic pathogens in the Middle East have resulted in disease epidemics of international importance, raising the need for health security enhancements to strengthen the region's ability to prevent, detect and respond to multiple zoonotic disease threats. In Jordan, MERS-CoV, AI and brucellosis are major public health concerns, with limited multisectoral preparedness capacity.2 MERS-CoV is recognized as a threat to global health security, with designation as a priority disease under the World Health Organization (WHO) Research and Development Blueprint.3 Although most cases have been reported in the Kingdom of Saudi Arabia (KSA), the first known human infections occurred in Jordan.4,5 Most cases in KSA have been healthcare-associated, stemming from secondary generations of transmission.6,7 Identification of factors involved in *primary* transmission may inform interventions to prevent future primary cases and therefore prevent them from seeding healthcare or community outbreaks. Camels are the presumptive source of primary human MERS-CoV infections; however, the exact mechanisms of transmission and the possible role of other livestock species are unclear.8 These uncertainties highlight the need to better understand the causal factors of primary human infection with MERS-CoV at human-livestock interfaces given the high livestock-human contact in camel production systems in Jordan.9 **Understanding modifiable risk factors may lead to development of public health interventions that can prevent animal-to-human transmission of zoonoses.**

Avian influenza viruses circulate worldwide among migratory bird populations and occasionally spill into poultry at mass production sites, farms, or backyard coops. Although not every AI subtype is capable of infecting humans or causing severe illness, highly pathogenic strains present risk to both animal and humans and are associated with major socio-economic losses. **In Jordan, the rapidly expanding poultry industry driven by ever-increasing demand poses a distinct global health security risk.** Identification and characterization of AI subtypes circulating among poultry across Jordan will provide critical information needed to understand baseline activity and risks. If human AI infections are detected, the project could identify causal factors in poultry-to-human influenza transmission, and therefore inform interventions to prevent future primary cases. **Given the human AI infections in neighboring countries, this is a critical gap to be filled in Jordan.**

To understand and reduce the threat of major zoonotic diseases in Jordan, we propose a One Health study in animals and humans to characterize exposure risks for priority pathogens that may potentially be associated with specific interfaces, behavioral practices, and environmental determinants (i.e., seasonality). To maximize potential for sustainability of zoonotic disease capacity in the country, the project is built around an all-hazards approach to detect pathogens and identify risk factors. Therefore, in addition to MERS-CoV and AI, *Brucella* spp. and *Leptospira* spp., which also cause morbidity in Jordan, will be integrated into the research study as secondary outcomes. Preliminary studies indicate associations between poor biosecurity and elevated seroprevalence of these bacterial diseases in animals in Jordan, as well as poor disease management practices when disease is suspected.10-12

Scientific Impact for C-WMD Science: Given that transmission of high-consequence zoonotic pathogens such as MERS-CoV and AI, whether by nature or ill intent, poses a significant threat to global security, existing gaps in biosurveillance/detection capabilities, prevention/response activities, and reporting weakens our ability to counter biological WMD threats. Over 60% of emerging infectious diseases originate in animals, so it is imperative to strengthen local capacity

to conduct biosurveillance for zoonotic disease threats to understand existing baselines of transmission, characterize risk factors to inform prevention activities that can interrupt transmission, and preempt and/or rapidly respond to emerging disease threats. As a key area of stability in the region, enhancing Jordan's capacity for threat reduction for these diseases that pose serious potential human health, economic, and food production and security consequences is critical to protect U.S. warfighters as well as our regional allies (e.g. Jordan, Israel). Based on our analysis of risk drivers, the study regions are identified as elevated risk for disease emergence; ground-truthing is imperative to detect circulation trends and mitigate threats.[13]

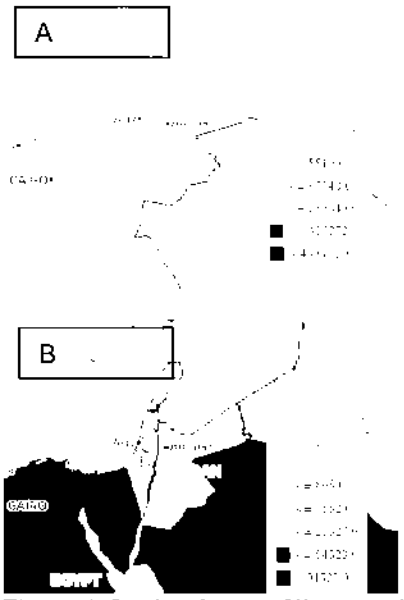

Figure 1. Regional map of live camel (A) and poultry (B) production, 2015

Through regional cross-training workshops held in Jordan, the project will also build upon and boost local capacity for prevention, detection, and reporting of zoonotic disease threats in Jordan, Iraq and Lebanon, all of which have substantial camel and poultry production (**Figure 1**). This will fill capacity gaps, strengthen collaborative relationships, and foster goodwill in a politically fragile region, enhancing our ability to combat biological threats.

Data will be analyzed to generate geospatial maps of livestock and poultry zoonoses, geospatial maps of human zoonotic disease risk (including static and temporal versions), exposure risk models using causal inference techniques, and prediction models for transmission that can account for seasonal variations and wide-scale livestock/poultry practice trends.

Regional Capacity Building: Iraqi and Lebanese scientists from their Ministries of Health and Agriculture will be invited to participate in capacity-building workshops in Jordan. Workshops will cover topics including implementing/using technology, animal and human sampling fieldwork, ethical human subjects research, biosafety and biosecurity best practices, data management and storage, and reporting procedures pursuant to OIE and WHO obligations. Advanced training for key individuals from Iraq and Lebanon is proposed for Year 3 and Option Years.

Our research project will serve multiple goals and objectives of the BTRP mission, by: 1) engaging partner country scientists in hypothesis-driven research; 2) supporting biosurveillance capacity building by enhancing partner capability to detect and report select agents; 3) enhancing understanding of zoonotic diseases to allow differentiation of natural versus nefarious emergence events; 4) employing responsible bio-risk management best practices; 5) training partner country researchers to think critically about ethical research and be competitive in soliciting international funding; and 6) promoting the One Health concept.

Major Goals and Milestones (details in Section VI): 1) Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan: *Implement animal study; Conduct PCR and serology testing.* **2)** Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses: *Implement human cohort study; Conduct PCR and serology testing.* **3)** Characterize causal factors in animal-to-human transmission of these zoonoses: *Implement behavioral risk survey; Conduct epidemiological analyses.* **4)** Produce geospatial maps of zoonoses in livestock/poultry and human zoonotic transmission risk: *Generate geospatial distribution and risk maps.* **5)**

Strengthen capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon: *Host workshops; Submit reports and publications; Attend presentations/meetings*. **6)** Identify specific modifiable risk factors for human infection with these zoonoses: *conduct causal interference analyses; provide policy recommendations.*

Methodology

Ethical Considerations: The study team will obtain required ethical approvals for both humans and animals prior to study initiation. For human subjects research, the informed consent documents (English and Arabic), study protocol (English), and questionnaires (English and Arabic) will be submitted to the Jordan University of Science and Technology (**JUST**) Institutional Review Board (IRB) in Irbid, Jordan and HummingbirdIRB in Needham, Massachusetts, USA (via EcoHealth Alliance (**EHA**)). For animal subjects research, the study protocol (English) will be submitted to the JUST Institutional Animal Care and Use Committee (IACUC) and a U.S. institution. All study team members will be trained on Collaborative Institutional Training Initiative (CITI) human subjects research (social/behavioral and biomedical), ethical research with animals ("Working with the IACUC"), and the USAID funded PREDICT-2 project training modules (basic laboratory safety, biosafety and biosecurity, safe animal sampling, cold chain implementation, and various other preparatory trainings). To maintain privacy, results will be presented in aggregate; no individual data will be shared.

Study Design: The proposed study is a prospective cohort study to evaluate behavioral and occupational risk factors for zoonotic infectious diseases (MERS-CoV, avian influenza, brucellosis, and leptospirosis) among persons living in Jordan in any of the five study regions. The exposure of interest is regularly (once a month or more) working with any livestock animal or poultry or sharing their living areas with these animals. Key sub-exposures will be evaluated to determine whether specific behavioral or occupational interactions with specific animal taxa or their living areas increase the risk of acquiring one of the four zoonotic infections being studied. The key sub-exposures, such as "milking camels" or "cleaning poultry cages," which may be identified as risk factors in this study, will be identified as modifiable risk factors – behaviors or interactions that can be targeted during future disease prevention activities (e.g., using gloves, wearing a face mask, vaccinations, hand washing, pasteurization, etc.).

Study Sites: Sites will be selected in five geographically-representative regions across Jordan: Northern Jordan (Al Ramtha), Middle Jordan (Al Zarqa), and Southern Jordan (Al Karak, Ma'an, and Aqaba). These regions were selected based on preliminary findings by our team and the presence of livestock production activities where we theorize pathogen transmission is likely to occur. Al Ramtha and Al Zarqa were included as part of the PREDICT-2 study on MERS-CoV in people, camels, and bats. Two individuals having a confirmed MERS-CoV seropositive test result were previously identified in Al Ramtha by our PREDICT-2 project. Al Zarqa is the location of the first ever known human cases of MERS-CoV reported to the WHO. In 2016, the Food and Agriculture Organization of the United Nations (FAO) detected MERS-CoV virus-positive camels in both Al Ramtha and Al Zarqa. Little is known about the current circulation of MERS-CoV among human or camel populations in Southern Jordan, but Southern Jordan has a greater density of camel livestock than Northern and Middle Jordan. There are numerous poultry farms in all five study regions; while avian influenza in poultry has been detected previously in Jordan, regional or national estimates of avian influenza incidence or prevalence are lacking and this study will therefore better elucidate distribution trends.

In each of the five study regions, sampling sites will be selected to ensure interfaces with poultry, camels, and other livestock animals are represented (e.g. farms or markets). Each region

will include one or more of three types of sampling sites: poultry farm or production interface, camel farm or production interface, and "other" livestock farm or production interface where a least one other non-poultry/non-camel livestock animal is present, such as cattle or sheep.

Potential sampling sites within each of the five regions will be identified and assessed prior to the beginning of the study and will be categorized by interface type (i.e., poultry, camels, "other," or a combination of multiple interface types) and expected number of persons in and around the site (<20, 21-50, 51-100, or 101+ persons). In each region, the study team will randomly select one site at a time until each of the three animal interface types are evenly represented, then continue to select additional sites until the combined expected number of persons in and around the selected sites exceeds 600 so the region enrollment goal (60) will remain less than 10% of the available population in the region. If it is not possible to reach this number, then all identified sites will be visited for that region. Selected sites will be visited in a random order during each region's first enrollment visit until all three interface types have been visited at least once and the site enrollment goal has been reached.

Study Population: The study will enroll persons regularly working with livestock or poultry or sharing their living areas with these animals as well as persons unexposed to these factors. Based on site selection, people living or working in the five regions will be eligible for recruitment in the study. Inclusion criteria are adults (18 years or older) providing informed consent and children (12 years or older) providing verbal assent and having a parent or guardian able to provide informed consent. Informed consent or assent may be withdrawn by the participant or their parent or guardian at any time during the study procedures or at any future study visit. Exclusion criteria are children less than 12 years old, adults unwilling or unable to provide informed consent, children aged 12-17 years old unwilling or unable to provide assent, and children aged 12-17 years old without a parent or guardian willing or able to provide informed consent. Those approached for recruitment who provide informed consent (and assent if a child) and complete a brief pre-screening questionnaire will be enrolled if they are selected based on their exposure status and the study recruitment quota for the exposed or the unexposed.

Sample Size Calculations: Using an acceptable Type I error rate of 5% and power of 80%, the minimum sample size was computed to detect a difference where 1% (1 out of 100) of unexposed persons (those who do not regularly work with livestock animals or poultry or share their living areas) will have at least one positive test result for at least one of the four zoonotic infections during the study and 12.5% (1 out of 8) of exposed persons (those who regularly work with livestock animals or poultry or share their living areas) will have at least one positive test result for at least one of the four zoonotic infections during the study. Given these parameters while using the Fleiss method with a continuity correction applied, the minimum sample size needed for the study is 73 unexposed and 145 exposed individuals.

It is estimated that up to 20% of study participants may be lost to follow-up over the course of the study. To maintain the minimum sample size needed to detect the statistical associations of interest, a correction factor of 1.25 (division of 80%) was applied to the minimum sample size. This results in 91 unexposed and 181 exposed individuals needed at the beginning of the study. To account for the marginal possibility that some participants already have evidence of infection with at least one of the four zoonotic infections at the beginning of the study (and therefore must be excluded from the prospective cohort study), these enrollment goals will be rounded up to 100 unexposed and 200 exposed persons, for a total of 300 participants. This results in enrollment goals of 20 unexposed and 40 exposed persons in each of the five regions.

Study Procedures: All written and verbal interactions with potential study participants will be conducted in Arabic by native Arabic-speaking study team members. Individuals present at each study site will be approached for possible recruitment into the study through systematic random sampling until the site's exposed and unexposed enrollment goals are met. Cell phone calling cards are deemed to be a culturally- and financially-appropriate token of appreciation and will be offered to enrolled participants at each visit to encourage retention in the study but not to unduly influence a participant's willingness to participate. Livestock herders will also be offered veterinary medicines and supplies every other visit to recognize their time and to raise awareness about disease management. Participants providing informed consent will be asked to complete a pre-screening checklist to determine enrollment status. This checklist will rapidly assess whether the participant would be categorized as "exposed" or "unexposed" in the study based on their interactions with livestock and poultry or their living areas. Participants will be enrolled at each site until the maximum enrollment for the exposure category for the site has been reached.

Enrolled participants will be assigned a unique identifier to track their future participation over the course of the study. Contact information will be collected to reach them for future visits. Study site visits will be made every three months for a total of 13 study visits per site. Although it is expected that not all participants will be available at every study site visit, every effort will be made to provide ample opportunities for continued participation.

Upon initial enrollment, participants will be verbally administered a standardized questionnaire by a trained member of the field team based on our PREDICT-2 Human Behavioral Risk Questionnaire (example provided in Attachment 3) augmented with animal-specific exposure frequency questions to collect demographic data, symptom and medical history data, social history data, and specific animal-related behaviors and practices that are possible risk factors for infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. During all future visits, enrolled participants will be administered a brief follow-up questionnaire designed primarily to capture time-varying exposure and covariate data. Participants will be asked to have NP/OP swabs taken at all visits. Serum will be collected on the 1st, 7th, and 13th visit. Beginning with the first visit, the study team will also conduct opportunistic sampling of livestock taxa and poultry at each site as described in the following section. To detect potential pathogen sharing, animal and human sampling will occur within the same week (ideally the same days) at each site. Since animals are not the subject of the cohort study design (and instead will be sampled to provide covariate data for statistical modeling), there is no minimum sample size required at a given site or sampling visit. The livestock or poultry present at each site may differ from sampling visit to sampling visit, and therefore individual animals will not be sampled longitudinally. Animal sampling parameters are provided below.

Sampling Schedule and Laboratory Assays: Sampling will begin during the third quarter of Year 1. Each site will be visited every 3 months until the final visit during the third quarter of Option Year 1 for a total of 13 sampling visits (**Table 1**). Sites will be visited sequentially during each sampling period, with several days allotted for sampling at each site.

Table 1. Sampling schedule for proposed study.

Year 1	Q1		**Year 2**	Q1	S_3	**Year 3**	Q1	S_7	**OY1**	Q1	S_{11}
	Q2			Q2	S_4		Q2	S_8		Q2	S_{12}
	Q3	S_1		Q3	S_5		Q3	S_9		Q3	S_{13}
	Q4	S_2		Q4	S_6		Q4	S_{10}		Q4	-

*OY=Option Year; Q=Quarter; S_n=Sampling visit number

Human Sampling: Individuals enrolled in the study will be asked to have two NP/OP swabs taken at each visit (**Table 2**). Each participant's swabs will be tested for MERS-CoV and influenza via RT-PCR after each sampling visit. At the 1st, 7th, and 13th (or final) sampling visit, serum will be collected for serology testing for MERS-CoV, AI, brucellosis, and leptospirosis antibodies (**Table 2**). Depending on location and participant preference, sampling will occur at the field site (in a safe sheltered area) or via appointment at a medical clinic in areas where there is access to one. All human samples will be collected under the supervision of a trained nurse.

Table 2. Specimen type, assay, and sampling frequency for humans.

Specimen Type	**Assay**	**Infection**	**Frequency**
NP/OP swabs (2x each)	RT-PCR	MERS-CoV	Each visit (3 mos.)
		Influenza	Each visit (3 mos.)
Serum	Serology	MERS-CoV	1st, 7th, and 13th visit
		Influenza	1st, 7th, and 13th visit
		Brucellosis	1st, 7th, and 13th visit
		Leptospirosis	1st, 7th, and 13th visit

*NP/OP=Nasopharyngeal and oropharyngeal

Livestock and Poultry Sampling: During each site visit, livestock and poultry will be opportunistically sampled by a licensed veterinarian or technician to assess infectious activity among animals present as well as to provide covariate data for the human study (i.e., "MERS-CoV-positive camels present at site"). Nasal swabs will be collected from up to 20 livestock animals per animal taxa at each site per visit, and oropharyngeal (OP) swabs will be collected from up to 20 poultry at each site per visit. Sampled animals will be temporarily marked with an adhesive colored band to avoid redundant sampling during the duration of the study site visit, which may last several days. Animal sampling schedule is provided in **Table 3**.

Laboratory testing: All testing will be conducted in Jordan at laboratories at the Jordan University of Science and Technology (JUST). Nasal swabs will be tested for MERS-CoV by RT-PCR at the Molecular Biology and Virology lab (MBVL) in the Faculty of Veterinary Medicine to detect whether at least one MERS-CoV-positive livestock animal was present at the site when humans were being sampled. MERS-CoV real time PCR is based on targeting upE and ORF 1a as proposed by Corman, 2012.[14] OP swabs will be tested for Influenza A by RT-PCR at the MBVL/JUST. Real time PCR for influenza A will be done according to Spackman and Suarez, 2008,[15] and for H5, H7 and H9 the protocol will be based on Monne et al, 2008.[16]

On the 1st, 7th, and 13th (final) sampling visit, blood for serum testing will be collected from humans, livestock and poultry to be tested for MERS-CoV, influenza, brucellosis, and leptospirosis antibodies using serology (**Table 3**). Human serum will be tested for MERS-CoV antibodies at the Princess Haya Biotechnology Center (**JUST**) employing methods to be transferred by Co-I Kayali (**Human Link**) from the Human Link lab at the National Research Centre in Egypt using a pseudoparticle neutralization (ppNT) assay where the spike protein of MERS-CoV is expressed by a replication-incompetent human immunodeficiency virus (HIV), thus avoiding the use of live MERS-CoV in the assay as described by Co-I Kayali.[17] Sera will be screened at a dilution of 1:10 and positive sera will be tested for end-point titers. As this capacity will be novel for Jordan, Co-I Kayali will provide training and quality control for testing.

Animal serum will be tested for MERS-CoV antibodies at the Diagnostic Laboratory-Faculty of Veterinary Medicine using a S1-based ELISA kit from EUROIMMUN.[18] Human and animal serology for avian influenza will be performed at the Diagnostic Laboratory using Hemagglutination inhibition and serology according to the published protocol by Kayali et al,

2008.[19] Human and animal serology for brucellosis will be conducted at the Diagnostic Laboratory using the rose Bengal test for screening and a brucellosis complement fixation test (from Jordan Bio Industries Center (JOVAC), Amman, Jordan) for confirmation. Human and animal serology for Leptospirosis will also be conducted at the Diagnostic Laboratory using a commercially available ELISA test. **All samples will be made available to other DTRA- or USG-funded researchers. All collected materials will be will be transported from field to labs on wet or dry ice by project personnel and stored in approved facilities indicated in the PRAT forms and destroyed at the conclusion of the study.**

Please see Attachment 3 for a flowchart with the overall sampling and laboratory study design. The proximity of the three laboratories at JUST will enable safe and efficient specimen transport, and has the added benefit of making interaction between the human and animal laboratories more routine to promote uptake and sustainability of a One Health approach.

Positive tests results for reportable diseases will be provided to relevant Jordanian authorities immediately for action as done by our group under USAID PREDICT-2.

Table 3. Specimen type, assay, and sampling frequency for livestock and poultry.

Specimen Type	Assay	Infection	Frequency
Nasal swabs (by taxa + site) - livestock	RT-PCR	MERS-CoV	Each visit (3 mos.)
Oropharyngeal swabs (by site) - poultry	RT-PCR	Influenza	Each visit (3 mos.)
Serum – livestock	Serology	MERS-CoV	1st, 7th, and 13th visit
		Brucellosis	1st, 7th, and 13th visit
		Leptospirosis	1st, 7th, and 13th visit
Serum – poultry	Serology	Influenza	1st, 7th, and 13th visit

Analysis Plans

Geospatial Risk Mapping: Following completion of each quarter's sampling visits and testing, geospatial maps of human and animal infections with MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated. These will be shared with USG/ DTRA and Jordanian Ministry partners quarterly. Once human behavioral risk data become available, preliminary statistical models will be constructed to generate geospatial risk maps directly linking human-animal interactions with risk of human infection with the four zoonoses.

Temporal Assessment: At the completion of the third year's sampling visits, human and animal zoonotic infections with MERS-CoV, avian influenza, brucellosis, and leptospirosis will be assessed for potential temporal effects in Jordan. This will be updated should the option years be exercised. This will provide critical information on expected background activity of each zoonosis geographically by time of year, which will be essential in determining whether future zoonotic infection activity is exceeding baseline activity due to either a life course (e.g. birthing) or seasonal factor or other unintended outbreak or nefarious activity.

Epidemiologic Causal Inference to Identify Modifiable Risk Factors: Specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) will be assessed for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. These potential modifiable risk factors will be determined through epidemiologic analysis of the questionnaire data (including time-varying data) paired with individual laboratory results (e.g., detection of viral RNA, bacterial DNA, or antibodies). Causal inference techniques within the potential outcomes framework will be employed to solidify statistical associations as concretized biological/ clinical/environmental pathways by operationalizing exposures as well-defined interventions and ensuring exchangeability is maintained through confounder control informed by directed acyclic

graphs of the conceptual exposure-disease pathways. While the study may detect associations specific to each of the four diseases, the intent of the study is designed to examine multiple zoonotic pathogens to inform general threat reduction guidelines and identify areas for future study. Identification of modifiable risk factors will inform intervention development that may interrupt future zoonotic transmission of the four pathogens in this study, which will be shared with USG/DTRA and the Jordanian Ministry partners at the annual stakeholders meeting in Year 3 and Option Year 2 as well as during in-person meetings with ministry officials and the threat reduction workshop as potential policy guidance for Jordanian authorities.

Training and Workshops: Training workshops will be held in Jordan throughout the project and will be open to scientists from the Ministries of Health and Agriculture from Jordan, Iraq, and Lebanon (**Table 4 and Attachment 3**) based on recommendations from existing partnerships. The workshops will be delivered by scientists from EHA, JUST and Human Link. Project staff will be trained to collect biological samples, to promote animal welfare and ethics, and on human subjects research ethics, obtaining valid, informed consent and administering questionnaires (**Attachment 3**). Staff will be cross-trained so that members of the animal health team will be trained to give questionnaires and members of the human health team will be trained to record animal data to promote efficient collaboration in field activities and the One Health concept. We will invite additional stakeholders to select workshops via Jordan's One Health platform to encourage multisectoral buy-in, interpretation and understanding of study findings, and novel collaborations on solutions for threat reduction. We anticipate including 4 professional students per year (20 total) in field, laboratory and analytical components of the project. estimated at four students from public health (field studies and socio-economic analyses). four nursing students (field studies), four undergraduate and four graduate students from the School of Veterinary Sciences (field studies). and four graduate students in biomedical sciences (laboratory). Three Jordanian scientists and three students will also be trained in laboratory techniques at the Human Link laboratory in Egypt in year 1. followed by on-site training in Jordan in remaining years. In addition, in-service training will be provided to the Ministry of Health and Ministry of Agriculture laboratory scientists and epidemiologists during the workshops (Table 4). We estimate a minimum of 20 government staff will participate in each of the training workshops. providing wide reach for sustainability of capacity generated in the region. The laboratories in the South of Jordan in particular will greatly benefit from the 5 years of sharing techniques and skills transfer to their ministry officials to directly advance their day-to-day capacity.

Table 4. Proposed training and regional capacity-building workshops (see Attachment 3 for more details).

Date	Workshop Topic(s)	Audience
Year 1 Q2	• Basic Laboratory Safety, Biosafety and Biosecurity, Cold Chain Implementation, Ethical Human Subjects Research, Ethical Animal Subjects Research, Safe Human Sampling, Safe Animal Sampling, Questionnaire Administration, Data Management and Storage	Study team
Year 2 Q3	• All Topics Covered by First Workshop • Disease Reporting Procedures (OIE, WHO IHR)	Regional MOH/ MOA scientists
OY 1 Q3	• Influenza Subtyping, Genomic Analysis of MERS-CoV • Biosafety and Biosecurity Refresher Training	Study Team, Regional MOH/ MOA scientists
OY 2 Q3	• Workshop 1: Geospatial Analysis, Advanced Epidemiology, One Health Disease Surveillance; Workshop 2: Risk Reduction • Biosafety and Biosecurity Refresher Training	Regional MOH/ MOA scientists; OH Platform

III: PROGRAMMATICS

In the past three years, EHA and JUST have co-led implementation of the USAID Emerging Pandemic Threats PREDICT-2 project in Jordan, developing critical surveillance and laboratory capacity for MERS-CoV detection in the country. Through regional partnerships under PREDICT-2 the organizations also collaborated with Human Link on MERS-CoV and broader CoV and Influenza sampling and diagnostics in Jordan and Egypt. **Data collected from these studies in coordination with Ministries of Health and Agriculture represent some of the leading multi-year studies of viral circulation in animals in the region and generation of some the first evidence of camel-human transmission dynamics, which form the basis of the proposed study.** EHA also leads a bat CoV pathogen research network in Western and Central Asia (WAB-Net), with Co-Investigators from Jordan (RSS). Our project team facilitated the establishment of Jordan's One Health platform, which brings together focal points from Ministries of Agriculture, Environment and Health, WHO, FAO, OIE, JUST, and the Royal Scientific Society of Jordan. This platform provides a foundation for our multisectoral project to disseminate results and develop practical, country-relevant policy recommendations and promote long-term capacity sustainment.

Table 5. Project partners and roles.

Institution	Study design	Human cohort recruitment	Human sampling, & training	Animal sampling, & training	Lab testing & training	Analysis & dissemin-ation
EHA	✓(Lead)	✓ (Co-Lead)	✓	✓ (Co-Lead)		✓ (Lead)
Overall project oversight; weekly phone calls with partners; study design development and refinement field sampling; human subjects research & training; data analysis; and information dissemination through workshops, conferences, and papers; Tasks 1-6				*William B. Karesh*, DVM (PI); *Catherine Machalaba*, MPH, (CoI) Epidemiologist, Project Coordinator; *Emily Hagan*, MPH, Behavioral Risk Scientist; *Whitney Bagge*, PhD, Data Analyst/Mapping/Modeling		
JUST	✓	✓ (Lead)	✓ (Lead)	✓ (Lead)	✓ (Lead)	✓ (Co-Lead)
Overall project oversight for Jordan-based activities; study design; field and lab oversight and personnel decisions; Jordan staff management; laboratory training, staffing, & testing; liaison with MOH on human studies; liaison with MOA for animal studies; data analysis & dissemination; Tasks 1-6				*Ehab Abu-Basha*, MSc, DVM, PhD (Co-I) *Zaidoun Saleh Hijazeen*, MSVet Med, Infectious Diseases, Veterinarian *Moh'd Borhan Al-Zghoul*, MS, PhD, Immunologist, Molecular Biologist *Mustafa Ababneh*, BSVetMed, PhD, Laboratory Diagnostics, Virologist *Saad Gharaibeh*, BSVetMed, PhD, Avian Diseases, Virologist *Zuhair Bani Ismail*, BSVetMed, Clinical Med, Camels, Leptospirosis *Hani A. M. Talafha*, MS, Field Coordinator *Saied Jaradat*, PhD, Molecular Biologist		
Human Link	✓		✓		✓ (Co-Lead)	✓
Conduct and oversee training of Jordanian scientists on human testing for MERS-CoV; study design, data analysis & dissemination; Tasks 2,5				*Ghazi Kayali*, MPH, PhD, (CoI) Virologist, Epidemiologist		
US CDC	✓					✓
Project advisor on zoonotic diseases; data dissemination planning and implementation support; Tasks 1-6				*Patrick Dawson*, MPH, PhD, (CoI) Epidemiologist		

Jordan MoA	✓			✓	✓	✓
Project advisor on zoonotic diseases; data dissemination planning and implementation support; Tasks 1,3,5.6				*Mahmoud Alhanatleh*, BSVetMed, Chief Veterinary Officer, Jordan		
Jordan FDA	✓					✓
Project advisor on zoonotic diseases; data analyses; implementation support; Tasks 2-6				*Wail Hayajneh*, MBBS (MD), Chairman, Infectious Diseases Comm., Jordan FDA		

IV: RELEVANCE

Our team in collaboration with FAO, Kansas State University, and the National Institute of Health (NIH)'s Rocky Mountain Laboratories conducted a nationwide study of MERS-CoV in camels. Out of 120 samples, 36 were positive. This was the first-ever report of this disease to OIE in camels in Jordan. To date, only few countries have reported virus-positive MERS-CoV test results to the OIE so this is a significant and important step in improving both detection and reporting in the Middle East. Furthermore, humans were sampled at two sites to screen for MERS-CoV and 2 samples were confirmed positive. This demonstrates One Health in action in Jordan led by the JUST/EHA PREDICT-2 team. These results were published under the title "High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan".[20] There are no reports of human leptospirosis in Jordan. However, a recently published article showed that approximately 27% and 53% of apparently healthy dairy cows and recently aborted cows are seropositive to Leptospira Hardo and Pomona.[10] Therefore, a serious outbreak of human leptospirosis could occur due to close contact between humans and dairy cows in the country. Regarding brucellosis, a study revealed that people who milk sheep and goats, consume raw cheese made from sheep and goat milk, consume raw cows' milk, and boiled cheese are more likely to be treated for brucellosis.[21] The limited diagnostic capacity in the south of Jordan is one barrier to effective risk monitoring and gaps in knowledge, and this project will provide the data and training needed to build their capacity as well as strengthen capacity nation-wide. While MERS-CoV is a national priority in policy, at present the country lacks the capacity for detection which hinders threat monitoring and reduction. Equipping JUST with diagnostic capacity to safety test for MERS will provide a platform for future use for surveillance, including with the government, and will make for easy skills transfer to government agencies that can be sustained through future collaboration. Success of prior projects demonstrates that JUST will maintain the technology once established. By emphasizing in-service training and involving government partners in all project components from sampling methods to risk reduction strategy development, this project will facilitate implementation of plans to counter MERS-CoV, HPAI and other priority diseases such that they become routine and valued and can be self-sustained through government operations, academic training, and research programs. We also anticipate that as the poultry industry grows it will better utilize Avian Influenza surveillance (including via inputting resources) for poultry as seen in other countries with developing poultry industries.

V. CREDENTIALS

PI: Dr. William Karesh is the Executive Vice President for Health and Policy at EHA. He serves as the President of the OIE Working Group on Wildlife Diseases and on the WHO IHR Roster of Experts. Dr. Karesh has served as PI on several large-scale, multi-partner projects, including two DTRA-funded projects on RVF in South Africa, and as Technical Director and EPT Partners Liaison for the USAID Emerging Pandemic Threats PREDICT and PREDICT-2 projects, together a $200+ million effort focused on predicting and preventing pandemic diseases. Dr. Karesh coined the term One Health in 2004. He has created, directed and managed projects and programs in 56 countries, including efforts to minimize the impact of diseases such as RVF,

Ebola, avian influenza, and anthrax as well as supporting global surveillance systems for emerging diseases. He is a leading global expert on MERS, recently serving on the OIE *ad hoc* group on MERS-CoV, and assisted the Kingdom of Saudi Arabia in implementing MERS investigations in animals. He is currently Co-PI of the DTRA BTRP West Asia Bat Research Network, which will promote project synergies in the region.

Prime Organization: EcoHealth Alliance (EHA) is a science-based organization incorporated over 45 years ago, currently working with local partners in over 20 countries at the nexus of human, animal, and environmental health. EHA's staff in New York includes leading scientists from a wide range of disciplines (veterinarians, epidemiologists, diagnostic experts, modelers, economists, social scientists, ecologists, analysts and IT researchers), and administrative and communications staff. EHA has an extensive record of publishing high-quality, peer-reviewed papers, journals, and briefing documents. Our team led development of a human behavioral risk surveillance protocol and questionnaire that has now been implemented in 28 hotspot countries for disease emergence.

JUST: Co-I Dr. Abu-Basha has led several projects related to emerging zoonotic infectious diseases including "Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria" and "Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan". He was country project lead and coordinator of the USAID PREDICT-2 Project, which advanced a global early warning system to detect, track, and predict the emergence of new zoonotic pathogens from wildlife that could pose a threat to human health. The MBVL/JUST laboratory is an important hub for training and preparing future scientists to perform techniques from sample handling to DNA extraction, cDNA synthesis, performing PCR protocols, cloning, plasmid purification, and sequencing analysis.

Human Link: Co-I Dr. Kayali has extensive experience on both MERS and Avian Influenza in the Middle East and Africa, conducting surveillance for avian influenza and MERS-CoV in humans and different animal species in several countries in the Middle East and Africa. He oversees two virology laboratories, one in Egypt at the National Research Centre in Egypt to be used in this project and one in Lebanon. Dr. Kayali is a world-renowned SME for influenza and coronaviruses. He is part of the NIAID CEIRS network and DTRA/GCRF CANARIES network and served as USAID PREDICT-2 lead for Egypt.

US CDC: Co-Investigator Dr. Patrick Dawson worked for EHA for 3 years overseeing the Jordan PREDICT-2 project work on viral zoonoses. As an EIS officer at CDC, he requires no funding from this project. He will be serving as project advisor on zoonotic diseases, and after Year 2, providing data analyses and dissemination. **Jordanian Ministry of Agriculture**'s Chief Veterinary Officer Dr. Mahmoud Alhanatleh served as an advisor on the USAID EPT PREDICT-2 project for the animal studies components. He will continue in this role for the proposed project. **Jordanian Food and Drug Administration** Chairman of the Infectious Diseases Committee Dr. Wail Hayajneh is a subject matter expert on zoonotic diseases, former dean of the JUST School of Medicine, and served as an advisor on the USAID EPT PREDICT-2 project. He will continue as a project advisor for the proposed project and serve as a liaison with the Jordanian government.

VI: WORK TO BE PERFORMED

Year 1:

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and poultry in Jordan. *Subtasks*: (Format: Year #. Task #. Subtask #)

1.1.1 Identify sites for project study. **1.1.2** Obtain local permissions and approvals to work with animals. **1.1.3** Conduct biological sampling of animals in the study areas. **1.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description and execution: **1) Study sites:** Within each of the five study regions, sites will be selected as described in the methods section. **2) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with animals. As part of obtaining local permissions we will also meet with community leaders, owners of animals, and poultry production facility managers. **3) Conduct biological sampling of animals:** Nasopharyngeal and oropharyngeal swabs will be collected from 300 camels, poultry and other livestock quarterly in Y1, Q3-Q4 as described above. Blood samples will be collected from 300 animals in Y1, Q3 as described above. **4) Conduct laboratory testing** for pathogens in Y1, Q3 and Q4 as described above. Laboratory security details are indicated in the PRAT form.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 7 laboratory scientists and veterinarians (conduct field and laboratory work, coordinate field and laboratory activities); **HL:** 1 research scientist, (laboratory technical advisor, laboratory training, data analysis); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Selection of study sites; Permits and ethical clearance obtained for animal studies; Project staff trained; Animal sampling implemented; Sample testing implemented.
Deliverable: animal test results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection.

Subtasks: **1.2.1** Identify sites and conduct enrollment for human study component. **1.2.2** Obtain approvals to work with human subjects. **1.2.3** Conduct biological sampling. **1.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description and execution: **1) Study sites and enrollment:** Based on site selection, people living or working in one of the 5 regions during the first, second, or third visits (until sample targets are reached) will be eligible for recruitment in the study as described above. **2) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with human subjects. As part of obtaining local permissions we will also meet with community leaders and poultry production facility managers. **3) Human biological sampling:** Nasopharyngeal and oropharyngeal swabs will be collected from 300 people quarterly in Y1, Q3 and Q4 as described above. Blood samples will be collected from 300 people in Y1, Q3 as described above. **4) Conduct laboratory testing** for pathogens in Y1, Q3 and Q4 as described above. Laboratory security details are indicated in the PRAT form.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 7 laboratory scientists and medical doctor (conduct and coordinate field and laboratory work, organize partner and stakeholder meetings, coordinate field and laboratory activities); **HL:** 1 research scientist, 1 laboratory technician (human serology, laboratory training, data analysis); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Local permissions obtained to conduct human study; Project staff trained; Human sampling implemented; Sample testing implemented.
Deliverable: Human test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.

Subtasks: **1.3.1** Obtain local permissions and approvals to work with human subjects. **1.3.2**

Conduct behavioral risk factor surveys in people. **1.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description and execution: **1) Local permissions:** Develop owner/worker questionnaire for the behavioral survey. Once U.S. ethical approval is finalized, submit protocols for local ethical clearance and permits to conduct research as described in methods section and obtain concurrence from local community leaders. **2) Conduct behavioral surveys:** Conduct behavioral survey on 300 people in Y1, Q3 and brief follow-up survey in Q4 as described in the Methods. **3) Data analysis:** Preliminary data analysis will begin in Y1, Q3 and continue in Q4.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 5 research scientists and medical doctor (conduct behavioral work, coordinate field activities); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Obtain local permissions to conduct behavioral risk study; Questionnaire app developed; Project staff trained; behavioral study implemented.
Deliverable: Behavioral risk factor study initiated.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.
Subtasks: **1.4.1** Generate geospatial maps of laboratory results. **1.4.2** Generate geospatial risk maps by addition of human behavioral risk data.
Description and execution: **1) Geospatial maps**: Lab results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated quarterly beginning Y1, Q3 and shared with USG/DTRA and Jordanian project partners. **2) Risk maps:** Use statistical models to link human behavioral data to laboratory findings beginning in Y1, Q4 and share with USG/DTRA and Jordanian project partners.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 5 research scientists (design methodology, conduct data collection and analyses); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Compile data; Develop models and conduct analyses; Develop and update geospatial maps and risk maps.
Deliverable: Initial geospatial maps and risk maps produced and shared.
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **1.5.1** Conduct project kick-off meeting in Amman with local stakeholders. **1.5.2** Train local project staff in proper techniques. **1.5.3** Host annual partners and stakeholders meeting. **1.5.4** Complete annual report and share with project partners and local stakeholders. **1.5.5** Conduct training workshops. **1.5.6** Data management. **1.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description and execution: **1) Project kick-off meeting:** Government partners and stakeholders will be invited to a project launch meeting to be held in Amman in Y1, Q1. **2) Train local project staff in proper techniques:** Before the field studies we will train (Y1)/retrain (OY1) our One Health field team as described above and in Attachment 3. **3) Annual partners and stakeholders meeting:** We will host an annual Stakeholders and Partners Meeting to inform stakeholders of our progress and receive feedback and input on the project. For this meeting we will invite local and national representatives of public health, veterinary health, environmental health/sciences, medical and laboratory officers as well as community leaders. To be held in

Amman Y1, Q4. **4) Annual Report:** compiled and delivered at the end of Y1, Q4. **5) Training Workshops:** To be held as described in Technical Narrative and Attachment 3 in Y1, Q2. **6) Data management:** A database will be developed, used for epidemiological analyses and shared among implementing partners (including government partners). While sensitive human data will remain protected, we will work with government partners and stakeholders to provide aggregated data as requested. Biobank sample repository information will be maintained in a DTRA-specified format and all samples and data generated during the course of the project will be available for at least 12 months after the project end date. Scientific and general reports will be generated. **7) Presentations and Meetings:** Project participants will attend DTRA Annual Technical Review as requested and other national or international meetings such as the International Meeting on Emerging Diseases or ASM Biothreats.

Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, support workshops, ensure the curation and analysis of data); **JUST:** 9 scientists and technicians (organize and support training workshops, organize partner and stakeholder meetings); **HL:** 1 research scientist (training in laboratory techniques and analyses); **CDC:** 1 research scientist (training in methods and data analyses).

Metrics of success: Training workshops completed; Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Participation in DTRA and scientific meetings.

Deliverable: Trained project personnel, reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.

Year 2:

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.

Subtasks: **2.1.3** Conduct biological sampling in animals within the study area. **2.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description, execution and resources: as in Year 1 except: **3) Biological sampling of animals:** Swabs will be collected from 300 camels, poultry and other livestock quarterly in Y2. No blood samples collected in Y2. **4) Laboratory testing:** performed quarterly in Y2 (PCR testing only).

Metrics of success: Animal sampling conducted; Sample testing conducted.

Deliverable: Animal sampling and testing conducted; Test results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection.

Subtasks: **2.2.3** Conduct biological sampling of people within the study area. **2.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description, execution and resources: as in Year 1 except: **3) Human biological sampling:** Swabs will be collected from 300 people quarterly. No blood samples will be collected from people in Y2. **4) Conduct laboratory testing:** performed quarterly in Y2 (PCR testing only).

Metrics of success: Participants re-enrolled; sampling conducted; Sample testing conducted.

Deliverable: Human sampling and testing conducted; Test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.

Subtasks: **2.3.2** Conduct behavioral risk factor surveys in people. **2.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.

Description, execution and resources: as in Year 1 except: **2) Conduct behavioral surveys:** Conduct brief follow-up behavioral survey (subset of larger survey with ethical clearance obtained) on 300 people in Y2, Q3. **3) Data analysis:** Data analysis will be conducted quarterly.

Metrics of success: Develop app for follow-up behavioral survey; Project staff re-trained; behavioral study conducted.
Deliverable: Behavioral risk factor study results report produced and shared.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.
Subtasks: **2.4.1** Generate geospatial maps of laboratory results. **2.4.2** Generate geospatial risk maps by addition of human behavioral risk data.
Description, execution and resources: as in Year 1 except: **1) Geospatial maps:** Lab results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated quarterly and shared with USG/DTRA and Jordanian project partners. **2) Generate geospatial risk maps:** Use statistical models to link human behavioral data to laboratory findings quarterly and share with USG/DTRA and Jordanian project partners.
Metrics of success: Update geospatial maps and risk maps; Share with project partners.
Deliverable: Updated geospatial maps and risk maps produced and shared.
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **2.5.3** Host annual partners and stakeholders meeting. **2.5.4** Complete annual report and share with partners and stakeholders. **2.5.5** Conduct training workshops. **2.5.6** Data management. **2.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Year 1 except: **3) Annual partners and stakeholders meeting:** to be held in Amman Y2, Q4. **4) Annual Report:** compiled and delivered at the end of Y2, Q4. **5) Training Workshops:** To be held as described in the Technical Narrative and Attachment 3 in Y2, Q3 as a regional workshop.
Metrics of success: Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.
Deliverable: Training workshop conducted, reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.
Year 3:
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.
Subtasks: **3.1.3** Conduct biological sampling in animals within the study area. **3.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 2 except: **3) Biological Sampling:** Blood samples collected in Y3, Q1. **4) Conduct laboratory testing:** Serology will be tested in Y3, Q1.
Metrics of success: Animal sampling conducted; Sample testing conducted.
Deliverable: Animal sampling and testing conducted; Test results report produced and shared.
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **3.2.3** Conduct biological sampling of in people within the study area. **3.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 2 except: **3) Human biological sampling:** Blood samples will be collected from people in Y3, Q1. **4) Conduct laboratory testing:** Serology will be tested in Y3, Q1.
Metrics of success: Participants re-enrolled; sampling conducted; Sample testing conducted.

Deliverable: Human sampling and testing conducted; Test results report produced and shared.
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **3.3.2** Conduct behavioral risk factor surveys in people. **3.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources as in Year 2.
Metrics of success: Project staff re-trained; behavioral study conducted.
Deliverable: Behavioral risk factor study results report produced and shared.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **3.4.1** Generate geospatial maps of laboratory results. **3.4.2** Generate geospatial risk maps with addition of human behavioral risk data.
Description, execution and resources as in Year 2.
Metrics of success: Update geospatial maps and risk maps; Share with project partners.
Deliverable: Updated geospatial maps and risk maps produced and shared.
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **3.5.3** Host annual partners and stakeholders meeting. **3.5.4** Complete annual report and share with project partners and local stakeholders. **3.5.6** Data management. **3.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Year 2 except: **3) Annual partners and stakeholders meeting:** to be held in Amman Y3, Q4. **4) Annual Report:** compiled and delivered the end of Y3, Q4. **5) Training Workshops:** no training workshops to be held in Y3.
Metrics of success: Hosting of project meetings; annual report with sample repository data to DTRA Thrust Area 6; reports to stakeholders; Participation in DTRA and scientific meetings.
Deliverable: Communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses.
Subtasks: **3.6.1** Conduct causal inference analyses based on data from Task 1, 2, 3. **3.6.2** Share results of analyses at annual partners and stakeholders meeting. **3.6.3** Submit written report to DTRA, local partners and stakeholders.
Description and execution: **1) Causal inference analyses:** as described in technical narrative. **2) Share Results:** at annual partners and stakeholder meeting Y3, Q4. **3) Written Report:** Results of analyses with identification and recommendations on modifiable risk factors delivered Y3,Q4.
Resources: **EHA:** 3 research scientists (design methodology, support JUST scientists, support workshops, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 4 research scientists (conduct data collection and analyses, support training workshops, organize partner meetings); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Initiate causal inference analyses; Deliver report to project partners and stakeholders on modifiable risk factors.
Deliverable: Causal inference analysis report produced and shared.
Option Year 1
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan. *Subtasks*: **O1.1.3** Conduct biological sampling of animals within the study area. **O1.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 3 except: **3) Biological Sampling:** Swabs will be collected in Q1, Q2, Q3 and blood samples will be collected from 300 animals in OY1, Q3.

Metrics of success: Project staff re-trained; Animal sampling and testing conducted.
Deliverable: Animal sampling completed; Test results report produced and shared.
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **O1.2.3** Conduct biological sampling within the study area. **O1.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 3 except: **3) Human biological sampling:** Swabs will be collected in OY1 Q1, Q2, Q3 and blood samples will be collected from 300 people in OY1, Q3.
Metrics of success: Project staff re-trained; Participants re-enrolled; Sampling conducted; Sample testing conducted.
Deliverable: Human sampling and testing conducted; Test results report produced and shared.
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **O1.3.2** Conduct behavioral risk factor surveys in people. **O1.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources: as in Year 3 except: **1) Behavioral surveys**: will be conducted in OY1 Q1, Q2, Q3.
Metrics of success: Project staff re-trained; Behavioral study conducted.
Deliverable: Behavioral risk factor study surveys completed; Results report shared.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **O1.4.1** Generate geospatial maps of laboratory results. **O1.4.2** Generate geospatial risk maps by addition of human behavioral risk data.
Description, execution and resources as in Year 3.
Metrics of success: Update geospatial maps and risk maps; shared with project partners.
Deliverable: Geospatial maps and risk maps produced and shared with partners.
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **O1.5.2** Train local project staff in proper techniques. **O1.5.3** Host annual partners and stakeholders meeting. **O1.5.4** Complete annual report and share with project partners and local stakeholders. **O1.5.5** Conduct local/regional training workshops. **O1.5.6** Data management. **O1.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Y1 except: **2) Train local project staff:** retraining. **3) Annual partners and stakeholders meeting:** to be held in Amman OY1, Q4. **4) Annual Report:** compiled and delivered at the end of OY1, Q4. **5) Training Workshops:** To be held as described in the Technical Narrative and Attachment 3 in OY1, Q3 as a regional workshop.
Metrics of success: Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.
Deliverable: Communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses.
Subtasks: **O1.6.1** Conduct causal inference analyses based on Task 1, 2, 3. **O1.6.2** Share results of analyses at annual partners and stakeholders meeting.

Description, execution and resources: as in Y3 except: **1) Conduct causal inference analyses:** continue as described in the Technical Narrative. **2) Share Results:** updated results at annual partners and stakeholder meeting OY1, Q4.
Metrics of success: Conduct causal inference analyses; Deliver report to project partners and stakeholders on modifiable risk factors.
Deliverable: Causal inference analysis report produced and shared.

Option Year 2

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan. *Subtasks*: **O2.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in OY1 except: **4) PCR and Serology testing:** to be completed by end of OY2, Q2.
Metrics of success: Animal sample testing conducted and completed.
Deliverable: Animal testing results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **O2.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in OY1 except: **4) PCR and Serology testing:** to be completed by end of OY2, Q2.
Metrics of success: Human sample testing conducted and completed.
Deliverable: Human sample testing final test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **O2.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources: as in OY1 except: analysis of survey results be completed by end of OY2, Q4.
Metrics of success: Conduct analysis of epidemiologic causal inference.
Deliverable: Behavioral risk factor study analyses completed; Final results report generated with identified modifiable risk factors and delivered to partners and stakeholders.

Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **O2.4.1** Generate geospatial maps of laboratory results. **O2.4.2** Generate risk maps by addition of human behavioral risk data.
Description, execution and resources: as in OY1 except: to be completed by end of OY2, Q4. Geo-spatial analysis technology will be transferred in the regional geospatial workshop (Task 5).
Metrics of success: Update geospatial maps and risk maps; shared with project partners.
Deliverable: Completed final geospatial maps and risk maps.

Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **O2.5.3** Host annual partners and stakeholders meeting. **O2.5.4** Complete annual report and share with project partners and local stakeholders. **O2.5.5** Conduct local/regional training workshops. **O2.5.6** Data management. **O2.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Y3 except: **3) Annual partners and stakeholders meeting:** to be held in Amman OY2, Q4. **4) Annual Report:** compiled and delivered at the end of OY2, Q4. **5) Training Workshops:** To be held as described in Technical Narrative and Attachment 3 in OY2, Q3 as a regional workshop.
Metrics of success: Hosting of project meetings; Completion of annual report with sample

repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.
Deliverable: Biobank sample repository information maintained in a DTRA-specified format. Final project reports delivered to partners, stakeholders and DTRA.

Task 6: Identify specific modifiable risk factors for human infection with these zoonoses.
Subtasks: **O2.6.1** Conduct causal inference analyses based on Task 1, 2, 3. **O2.6.2** Share results of analyses at annual partners and stakeholders meeting. **O2.6.3** Submit written report to DTRA and local partners and stakeholders.
Description, execution and resources: as in OY1 except: **1) Final causal inference analyses:** continue and complete as described in technical narrative by end of OY2, Q4. **2) Final Results:** final results provided at annual partners and stakeholder meeting OY2, Q4. **3) Final Written Report:** Final analyses results with identification and recommendations on modifiable risk factors delivered at end of OY2, Q4.
Metrics of success: Complete causal inference analyses; Deliver final report to project partners and stakeholders on modifiable risk factors.
Deliverable: Generate and deliver written report of analyses with identification and recommendations on modifiable risk factors.

VII: PERFORMANCE SCHEDULE

Task	Year 1	Year 2	Year 3	OY 1	OY 2
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan					
1.1. Identify sites for project study					
1.2 Obtain local permissions and approvals to work with animals					
1.3 Conduct biological sampling in animals within the study area					
1.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection					
2.1 Identify sites and conduct enrollment for human study component					
2.2 Obtain local permissions and approvals to work with human subjects					
2.3 Conduct biological sampling					
2.4 Conduct testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses					
3.1 Obtain local permissions and approvals to work with human subjects					
3.2 Conduct behavioral risk factor surveys in people					
3.3 Analyze epi causal inference to identify modifiable risk factors					
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk					
4.1 Generate maps of laboratory results					
4.2 Generate risk maps with human beh. risk data					
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon					
5.1 Conduct project kick-off meeting in Amman with local stakeholders					
5.2 Train local project staff in proper techniques					
5.3 Host annual partners and stakeholders meeting					
5.4 Complete annual report and share with partners and stakeholders					
5.5 Conduct local/regional training workshops					
5.6 Data management					
5.7 Conduct presentations/meetings at times and places specified					
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses					
6.1 Conduct causal inference analyses based on Task 1, 2, 3					
6.2 Share results of analyses at annual partners and stakeholders meeting					
6.3 Submit written report to DTRA and local partners and stakeholders					

Confirmed Proposal Expiration Date. "EHA holds the proposal, to include proposed costs, firm for 180 days after the submission due date, as included in the invitation to submit a full proposal."

References

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RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 1** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		291,211.20	2.00			48,535.20	17,860.95	66,396.15
Project Role:	PD/PI										
	Catherine		Machalaba		85,884.88	4.00			28,628.29	10,535.21	39,163.50
Project Role:	Co I										
	Emily		Hagan		67,747.18	3.00			16,936.80	6,232.74	23,169.54
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		86,100.68	2.50			17,937.64	6,601.05	24,538.69
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 153,267.88

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	3.00			14,930.85	5,494.55	20,425.40
1	Research Assistant	12.00			61,000.00	22,448.00	83,448.00
2	**Total Number Other Personnel**					**Total Other Personnel**	103,873.40

Total Salary, Wages and Fringe Benefits (A+B) 257,141.28

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	5,612.50
2. Foreign Travel Costs	37,272.00
Total Travel Cost	42,884.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,723.00
2.	Publication Costs	
3.	Consultant Services	4,949.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	556,511.08
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	574,183.08

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	874,208.86

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - Direct	32.00		101,663.29
Indirect - Subcontractors	32.00		10,713.33
	Total Indirect Costs		112,376.62

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	986,585.48

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	986,585.48

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_FEA- ReSubmi | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		291,211.20	2.00			50,961.96	18,754.00	69,715.96
Project Role:	PD/PI										
	Catherine		Machalaba		85,884.88	4.00			30,059.71	11,061.97	41,121.68
Project Role:	Co I										
	Emily		Hagan		67,747.18	3.00			17,783.63	6,544.38	24,328.01
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		86,100.68	2.00			15,067.62	5,544.88	20,612.50
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 155,778.15

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	3.00			15,677.40	5,769.28	21,446.68
1	Research Assistant	12.00			64,050.00	23,570.40	87,620.40
2	**Total Number Other Personnel**					**Total Other Personnel**	109,067.08

Total Salary, Wages and Fringe Benefits (A+B) 264,845.23

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	8,597.50
2. Foreign Travel Costs	36,372.00
Total Travel Cost	44,969.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,535.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,126.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	549,997.40
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	563,658.40

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	873,473.13

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - Direct	32.00		103,512.23
Indirect - Subs			4,509.59
	Total Indirect Costs		108,021.82

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	981,494.95

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	981,494.95

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_EEA- ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		291,211.20	2.00			53,510.06	19,691.70	73,201.76
Project Role:	PD/PI										
	Catherine		Machalaba		85,884.88	4.00			31,562.69	11,615.07	43,177.76
Project Role:	Co I										
	Emily		Hagan		67,747.18	3.00			18,672.82	6,871.60	25,544.42
Project Role:	Behavior Risk Scientist										
	Whitney		Bagge		86,100.68	2.00			15,821.00	5,822.13	21,643.13
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 163,567.07

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	3.00			16,461.26	6,057.75	22,519.01
1	Research Assistant	12.00			67,252.50	24,748.92	92,001.42
2	**Total Number Other Personnel**					**Total Other Personnel**	114,520.43

Total Salary, Wages and Fringe Benefits (A+B) 278,087.50

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	8,597.50
2. Foreign Travel Costs	36,371.00
Total Travel Cost	44,968.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,535.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,526.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	542,456.51
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	556,517.51

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	879,573.51

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - Direct	32.00		107,877.76
Indirect - Subcontractors	32.00		777.08
	Total Indirect Costs		108,654.84

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	988,228.35

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	988,228.35

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_EEA- ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		291,211.20	2.00			56,185.56	20,676.29	76,861.85
Project Role:	PD/PI										
	Catherine		Machalaba		85,884.88	4.00			33,140.83	12,195.82	45,336.65
Project Role:	Co I										
	Emily		Hagan		67,747.18	3.00			19,606.46	7,215.18	26,821.64
Project Role:	Behavior Risk Scientist										
	Whitney		Bagge		86,100.68	2.00			16,612.03	6,113.23	22,725.28
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 171,745.42

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	3.00			17,284.33	6,360.63	23,644.96
1	Research Assistant	12.00			70,615.13	25,986.37	96,601.50
2	**Total Number Other Personnel**					**Total Other Personnel**	120,246.46

Total Salary, Wages and Fringe Benefits (A+B) 291,991.88

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	8,597.50
2. Foreign Travel Costs	36,372.00
Total Travel Cost	44,969.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,535.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,126.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	531,929.45
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	545,590.45

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	882,551.83

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect Direct	32.00		112,199.16
		Total Indirect Costs	112,199.16

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	994,750.99

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	994,750.99

L. Budget Justification

(Only attach one file.) 1271 Budget Justification_EHA ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2024 **End Date:** 08/31/2025

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		291,211.20	2.00			58,994.84	21,710.10	80,704.94
Project Role:	PD/PI										
	Catherine		Machalaba		85,884.88	5.00			43,497.34	16,007.02	59,504.36
Project Role:	Co I										
	Emily		Hagan		67,747.18	3.00			20,586.78	7,575.34	28,162.72
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		86,100.68	2.00			17,442.65	6,419.90	23,861.55
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 192,233.57

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	3.00			18,148.54	6,678.66	24,827.20
1	Research Assistant	12.00			74,145.88	27,285.68	101,431.56
2	**Total Number Other Personnel**					**Total Other Personnel**	126,258.76

Total Salary, Wages and Fringe Benefits (A+B) 318,492.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	8,597.50
2. Foreign Travel Costs	28,766.00
Total Travel Cost	37,363.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,535.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,126.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	459,972.09
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	473,633.09

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	829,488.92

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect Direct	32.00		118,245.39
		Total Indirect Costs	118,245.39

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	947,734.31

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	947,734.31

L. Budget Justification

(Only attach one file.) 1271 Budget Justification_EHA ReSubmi

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		836,592.09
Section B, Other Personnel		573,966.13
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		1,410,558.22
Section C, Equipment		
Section D, Travel		215,155.50
1. Domestic	40,002.50	
2. Foreign	175,153.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		2,713,582.53
1. Materials and Supplies	38,863.00	
2. Publication Costs	24,000.00	
3. Consultant Services	9,853.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	2,640,866.53	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		4,339,296.25
Section H, Indirect Costs		559,497.83
Section I, Total Direct and Indirect Costs (G + H)		4,898,794.08
Section J, Fee		
Section K, Total Costs and Fee (I + J)		4,898,794.08

OMB Number: 4040-0001
Expiration Date: 12/31/2022

10 YEAR R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Instructions: On this form, you will attach the 10 Year R&R Subaward Budget files for your grant application. Complete the subawardee budget(s) in accordance with the 10 Year R&R budget instructions. Please remember that any files you attach must be a PDF document.

Click here to extract the 10 Year R&R Subaward Budget Attachment

Important: Please attach your subawardee budget file(s) with the file name of the subawardee organization. Each file name must be unique.

1) Please attach Attachment 1	JUST		Delete Attachment	View Attachment
2) Please attach Attachment 2	Human Link		Delete Attachment	View Attachment
3) Please attach Attachment 3		Add Attachment		
4) Please attach Attachment 4		Add Attachment		
5) Please attach Attachment 5		Add Attachment		
6) Please attach Attachment 6		Add Attachment		
7) Please attach Attachment 7		Add Attachment		
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 043805972 0000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 1** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	2.00			8,000.00	0.00	8,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 224,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	2.00			11,200.00	0.00	11,200.00
8	**Total Number Other Personnel**					**Total Other Personnel**	24,500.00
						Total Salary, Wages and Fringe Benefits (A+B)	249,400.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Vehicle	35,000.00
Luminescence plate reader	30,000.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment 65,000.00

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	41,098.00
2. Foreign Travel Costs	41,185.00
Total Travel Cost	82,283.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	36,908.96
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	53,500.00
9.	Meetings and Conferences	20,345.00
10.		
	Total Other Direct Costs	110,753.96

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	507,436.96

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		40,594.96
		Total Indirect Costs	40,594.96

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	548,031.92

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	548,031.92

L. Budget Justification

(Only attach one file.) 1272-Budget Justification_JUST-ReSubmi | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 043805971000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	4.00			22,400.00	0.00	22,400.00

8	**Total Number Other Personnel**	**Total Other Personnel**	35,700.00
		Total Salary, Wages and Fringe Benefits (A+B)	300,600.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	63,616.00
2. Foreign Travel Costs	27,238.00
Total Travel Cost	90,854.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	18,784.77
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	53,500.00
9.	Meetings and Conferences	32,469.50
10.		
	Total Other Direct Costs	104,754.27

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	496,208.27

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		39,696.66
		Total Indirect Costs	39,696.66

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	535,904.93

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	535,904.93

L. Budget Justification

(Only attach one file.) 1272-Budget Justification_JUST-ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 043805972 0000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	4.00			22,400.00	0.00	22,400.00

8	**Total Number Other Personnel**	**Total Other Personnel**	35,700.00
		Total Salary, Wages and Fringe Benefits (A+B)	300,600.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	63,616.00
2. Foreign Travel Costs	27,238.00
Total Travel Cost	90,854.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	7,666.97
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	77,500.00
9.	Meetings and Conferences	12,605.00
10.		
	Total Other Direct Costs	97,771.97

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	489,225.97

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		39,138.08
		Total Indirect Costs	39,138.08

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	528,364.05

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	528,364.05

L. Budget Justification

(Only attach one file.) 1272-Budget Justification_JUST-ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 043805970000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	2.00			10,000.00	0.00	10,000.00
2	Nurses	3.00			16,800.00	0.00	16,800.00
8	**Total Number Other Personnel**					**Total Other Personnel**	35,100.00
						Total Salary, Wages and Fringe Benefits (A+B)	300,000.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	52,357.00
2. Foreign Travel Costs	18,897.00
Total Travel Cost	71,254.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,255.19
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	65,500.00
9.	Meetings and Conferences	32,469.50
10.		
	Total Other Direct Costs	108,224.69

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	479,478.69

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		38,358.30
		Total Indirect Costs	38,358.30

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	517,836.99

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	517,836.99

L. Budget Justification

(Only attach one file.) 1272-Budget Justification_JUST-ReSubmi

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 043805972000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2024 **End Date:** 08/31/2025

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	2.00			10,000.00	0.00	10,000.00
6	**Total Number Other Personnel**					**Total Other Personnel**	18,300.00
						Total Salary, Wages and Fringe Benefits (A+B)	283,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	15,860.00
2. Foreign Travel Costs	35,579.00
Total Travel Cost	51,439.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.	Meetings and Conferences	78,212.50
10.		
	Total Other Direct Costs	78,212.50

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	412,851.50

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		33,028.12
		Total Indirect Costs	33,028.12

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	445,879.62

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	445,879.62

L. Budget Justification

(Only attach one file.) 1272-Budget Justification_JUST-ReSubmi

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		1,284,500.00
Section B, Other Personnel		149,300.00
Total Number Other Personnel	38	
Total Salary, Wages and Fringe Benefits (A+B)		1,433,800.00
Section C, Equipment		65,000.00
Section D, Travel		386,684.00
1. Domestic	236,547.00	
2. Foreign	150,137.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		499,717.39
1. Materials and Supplies	73,615.89	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	250,000.00	
9. Other 2	176,101.50	
10. Other 3		
Section G, Direct Costs (A thru F)		2,385,201.39
Section H, Indirect Costs		190,816.12
Section I, Total Direct and Indirect Costs (G + H)		2,576,017.51
Section J, Fee		
Section K, Total Costs and Fee (I + J)		2,576,017.51

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 1** **Start Date:** 09/01/2020 **End Date:** 08/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali		185,000.00	0.50			7,708.33	0.00	7,708.33

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,708.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 7,708.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8.	
9.	
10.	
Total Other Direct Costs	

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	7,708.33

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		770.83
		Total Indirect Costs	770.83

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	8,479.16

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	8,479.16

L. Budget Justification

(Only attach one file.) 1273 Budget Justification_Human Link | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 09/01/2021 **End Date:** 08/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali		185,000.00	0.50			7,708.33	0.00	7,708.33

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,708.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 7,708.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,103.00
	Total Travel Cost	3,103.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	12,811.33

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		1,281.13
		Total Indirect Costs	1,281.13

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,092.46

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,092.46

L. Budget Justification

(Only attach one file.) 1273 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 09/01/2022 **End Date:** 08/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali		185,000.00	0.50			7,708.33	0.00	7,708.33

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,708.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 7,708.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,103.00
	Total Travel Cost	3,103.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	12,811.33

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		1,281.13
		Total Indirect Costs	1,281.13

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,092.46

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,092.46

L. Budget Justification

(Only attach one file.) 1273 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 09/01/2023 **End Date:** 08/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali		185,000.00	0.50			7,708.33	0.00	7,708.33

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,708.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 7,708.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,103.00
	Total Travel Cost	3,103.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	12,811.33

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		1,281.13
		Total Indirect Costs	1,281.13

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,092.46

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,092.46

L. Budget Justification

(Only attach one file.) 1273 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 12/31/2022

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 09/01/2024 **End Date:** 08/31/2025

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali		185,000.00	0.50			7,708.33	0.00	7,708.33

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 7,708.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 7,708.33

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	3,103.00
	Total Travel Cost	3,103.00

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	2,000.00
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	2,000.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	12,811.33

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	10.00		1,281.13
		Total Indirect Costs	1,281.13

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,092.46

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,092.46

L. Budget Justification

(Only attach one file.) 1273 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		38,541.65
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		38,541.65
Section C, Equipment		
Section D, Travel		12,412.00
1. Domestic		
2. Foreign	12,412.00	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		8,000.00
1. Materials and Supplies	8,000.00	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		58,953.65
Section H, Indirect Costs		5,895.35
Section I, Total Direct and Indirect Costs (G + H)		64,849.00
Section J, Fee		
Section K, Total Costs and Fee (I + J)		64,849.00

BUDGET JUSTIFICATION FOR ECOHEALTH ALLIANCE

EcoHealth Alliance requests a total of $4.898.794 over all-years of the proposed project to support personnel, travel, equipment, consortium agreements, and applicable indirect costs.

A. Key Personnel
William B. Karesh, D.V.M., Principal Investigator (2.0 calendar months for all years). Dr. Karesh will be responsible for the overall coordination of this project. He will provide overall project oversight, study design development and refinement, data analysis, publication support, annual stakeholder meeting participation and visits to oversee field work. We request $48,535 in Y1 due to the high cost of living in New York City we request a 5% cost of living increase each subsequent year.

Catherine Machalaba, M.P.H., Co-Investigator (4.0 calendar months Y1-OY1, 5.0 calendar months OY2). Ms. Machalaba will be a technical advisor to the project, advising on study design and risk reduction. She to provide day-to-day project development and strategic management, including through regular in-person meetings and weekly phone and other direct communications with partners. She will also supervise field sampling, data analysis, and data and information dissemination through workshops, conferences, and papers. In OY2 she will conduct a risk reduction workshop as well as conduct a One Health economic analysis. We request $28,628 in Y1 with a 5% cost of living increase each subsequent year.

Emily Hagan, M.P.H., Behavioral Risk Scientist (3.0 calendar months in all years). Ms. Hagan will provide medical anthropology expertise for the questionnaires and analysis, supervise and conduct the IRB processes and trainings on the human subject work for local partners, and assist with data organization and analysis. We request $16,937 in Y1 with a 5% cost of living increase each subsequent year.

Whitney Bagge, Ph.D., Modeler (2.5 calendar months Y1, 2.0 calendar months in Y2-OY2). Dr. Bagge will be a technical advisor to the project, advising on data organization, analysis, and writing with a focus on statistical analytics and assist with study design, for which we request $17,938 in OY1.

B. Other Personnel
Amanda Andre, LMSW, Operations Assistant (3.0 calendar months in all years). Ms. Andre will be the administrative lead handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics. She will coordinate all meetings and travel and ensure compliance with funding and contractual requirements. We request $14.931 in Y1 with a 5% cost of living increase each subsequent year.

Research Assistant (12.0 calendar months in all years). A Research Assistant will be hired to assist in the development of reports, coordination of collaborators, and data cleaning, maintenance and analysis. We request $61,000 in Y1 with a 5% cost of living increase each subsequent year.

Fringe Benefits

Fringe benefits are calculated as 36.8% of base salary p.a. with $69,173 requested in Y1 calculated from the base salary for all Personnel. In Y2 OY2, we budget for a 5% per year cost of living allowance increase in all salaries.

C. Equipment
No funds are requested for equipment.

D. Travel
Domestic Travel
Domestic travel is requested for three trips per year for program staff to travel from New York City to Washington, DC for broader engagement of relevant partners and deliver presentations. EcoHealth Alliance has close relationships to the World Bank including a technical collaboration to optimize investments in health security and the application of the One Health approach. As requires, trips from New York City to Northern Virginia for two personnel to attend the CBEP meeting as included as well. Transportation is estimated at $400 per trip along with the government GSA per diem rates for Washington, DC ($251 for accommodation and $94 for meals and incidentals) and Northern Virginia ($161 for accommodation and $71 for meals and incidentals). Additional domestic travel support will facilitate EcoHealth Alliance staff presenting at a total of two domestic conferences annually, starting in Y2. One of these will be ASTMH in Maryland with transportation costs of $400, $157 for accommodation and $71 for meals and incidentals, along with one trip to APHA in San Diego with flights estimated at $500, $174 for accommodation and $71 for meals and incidentals. For each trip, $25 per day is estimated in taxi costs and for those that require transport to the airport $150 RT is included. In total, we are requesting $5,613 in Y1.

International Travel
Foreign travel is requested for partner meetings, in-country trainings, and field research. Three EHA employees will attend annual meetings each year, and two will make a second trip each year for trainings and field research. Flights for each of these trips is estimated at $1,500 and the federal per diem rates of $246 for lodging and $138 for meals in Amman, Jordan and $146 for lodging and $105 for meals while conducting field work outside of Amman, Jordan are requested. Additionally, we are requesting travel for staff to present on project findings at international conferences each year with flights estimated at $1,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria for International Meeting on Emerging Diseases and Surveillance (IMED). There are additional costs included for visa fees, vaccinations and conference registration fees. The total requested for international travel in Y1 is $32,272.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
Co-Investigator Catherine Machalaba and the Research Assistant to be hired will both need a new computer, equipped with Microsoft and Adobe software, for which we request a total of $6,000 in Y1. In order to analyze, manage, and produce graphical visualizations of data

a Stata license will be needed for which we request $600 p.a. Program staff will need a variety of programs on their computers in order to conduct project work including Dropbox, Adobe, Endnote, Microsoft Office, and Paperpile. Some already have access to these for other project work, but licenses will need to be obtained for some or split among other EcoHealth Alliance projects. To enable communication with partners, we've included telecommunications costs, an annual Zoom membership as well as $25 to be used on Skype to make international phone calls. We request a total of $38,863 over the full five years.

Publication Costs
To facilitate the dissemination of project findings, $6,000 per year in only Y2-OY2 is requested for open access publication costs in international peer-reviewed journals. This amounts to a request for $24,000 over the 5 years.

Consultant Services
For the human behavioral risk part of the project, $1,449 is in Y1 New England IRB, with $1,126 requested in each subsequent year as well as $400 in case of protocol amendment. Additionally, we request $3,500 in Y1 for required Collaborative Institutional Training Initiative training for personnel handling human and non-human animals and samples as per IRB and IACUC requirements. Thus, we request a total of $9,853 over the five year project.

Subawards/Consortium/Contractual Costs
Subcontracts for the Jordan University of Science and Technology (JUST) and Human Link are outlined in their individual budget justifications.

H. Indirect Costs
We are requesting the EcoHealth Alliance federally approved indirect cost rate of 32% on all applicable direct costs. The USA Department of Defense's Department of the Navy has approved this rate on 17 July 2019. We have applied our indirect cost rate to the first $25,000 of the subcontracts. We request $112,377 in Y1 and $539,607 over the five years of the project.

BUDGET JUSTIFICATION FOR JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, JORDAN

The Jordan University of Science and Technology (JUST) requests a total of $2,576,018 over all years of the proposed project to support personnel, travel, equipment, other direct costs and indirect costs.

A. Key Personnel

Ehab Abu-Basha, Ph.D., Co-Investigator (12.0 calendar month for all years). Dr. Abu-Basha will provide overall project oversight for Jordan-based activities. Dr. Abu-Basha will be leading all elements on the human and animal subjects research side of the project as well as the laboratory diagnostics elements. Dr. Abu-Basha will ensure JUST meets project tasks and milestones, will oversee JUST's budget, and will assist with dissemination of findings through publications and conference presentations. We request $128,400 p.a. in salary for Dr. Abu-Basha.

Hani Talafha, M.S., Biologist (8.0 calendar month for all years). As Director of Research Services at JUST, Mr. Talafha will co-oversee field work and assist in Jordan staff management, for which $32,000 is requested p.a.

Zaidoun Hijazeen, M.S, Veterinarian (2.0 calendar month for Y1, 12.0 calendar month Y2-OY2) Dr. Hijazeen will co-oversee field work, assist in study design and train and manage Jordan staff for which $8,000 is requested starting in Y1.

Mustafa Ababneh, Ph.D., Virologist (2.5 calendar month for Y1-OY2). As Lab Director, Dr. Ababneh will provide oversight of laboratory staff and activities, conduct laboratory analyses, provide interpretation of test results, supervise and train students, for which $15,000 is requested p.a.

Zuhair Bani Ismail, B.S., Livestock Expert (2.5 calendar month for Y1-OY2). Mr. Ismail will be responsible for the livestock sampling compliance and interpretation of test results for which $12,500 is requested p.a.

Borhan Al-Zoghoul, Ph.D., Molecular Biologist (3.0 calendar month for Y1-OY2). As Lab Director, Dr. Al-Zoghoul will provide oversight of laboratory staff and activities, conduct laboratory analyses, provide interpretation of test results, supervise and train students, for which $15,000 is requested p.a.

Bilal Al-Omari, BSc, Lab Supervisor (3.0 calendar month for Y1-OY2). As Lab Supervisor, Mr. Al-Omari will conduct laboratory analyses, provide interpretation of test results, supervise and train students for which $9,000 is requested p.a.

Wail Hayajneh, MBBS, Human Identification Expert (1.0 calendar month for Y1-OY2). Mr. Hayajneh will assist with study design for the human components of the study and serve as government liaison, for which $5,000 is requested p.a.

B. Other Personnel

Saad Gharaibeh, Ph.D., Avian Pathologist (1.0 calendar month for Y1-3, 2.0 calendar months for OY1-OY2). Dr. Gharaibeh will assist with study design and implementation for the poultry components, provide interpretation of test results, and provide guidance on recommendations for which $5,000 is requested starting in Y1.

Administrative Assistant (3.5 calendar months for Y1-OY2). The administrative assistant will be handling project management responsibilities related to expenses, managing of the subcontract, scheduling and logistics, for which we request $6,300 p.a.

Nurses (2.0 calendar months for Y1, 4.0 calendar months for Y2-3, 3.0 calendar months for OY1). Two Jordanian nurses will be responsible for assisting with the human sampling at the field study sites. We request $78,800 over the proposed five years of the project for these two positions.

C. Equipment

A field vehicle for field sampling and sample transport is estimated at $35,000. A luminescence plate reader will be purchased to be utilized in the Princess Haya Biotechnology Center to conduct the pseudo-particle neutralization assay. This equipment is estimated at $30,000. The current agreement with DTRA and the US Embassy in Jordan will allow the vehicle and other equipment to be imported without having to pay VAT.

D. Travel

Domestic Travel

In order to conduct field sampling, teams of five, including two nurses, will be visiting five sites (Al Ramtha, Al Zarqa, Al Karak, Ma'an, Aqaba) for five days each twice in Y1, four times in Y2-Y3 and three times in OY1. Field staff will be provided with a per diem for food and lodging of $60 per person per day. In order to cover meals, lodging, fuel for both field work and meetings around Irbid and Amman (an estimated 30,000 km Y1-OY1 and 10,000 miles in OY2) and vehicle maintenance we request $21,580 in Y1.

An additional cost of field work will be to provide study participants with token of appreciation as well as refreshments for those participating in the human work. For human study participants, they will be provided with light refreshments (juice, snack), estimated at $1.25 per person per visit, as well as with a 5JD ($11.28 USD) pre-paid telephone calling card as incentive for participation. Camel and poultry farmers/owners (approximately 30 of each) will be provided with appropriate medicines and supplies for their animals at every other quarterly visit, valued at $100 per farmer/owner per visit. In total we are requesting $19,518 in Y1 for these tokens.

International Travel

We are requesting travel for Jordanian project participants to attend an average of five regional conferences and five international conferences each year to present on project findings. The regional conference flights are estimated at $600 and hotels and meals at the government GSA per diem rates for Istanbul, Turkey of $299 and $131, respectively. For the international conference flights are estimated at $800 and hotels and meals at the government GSA per diem rates for Vienna, Austria of $221 and $122, respectively. We are requesting travel for Dr. Abu-Basha to the DTRA meeting in Northern Virginia, with the flight estimated at $1,000 and hotels

and meals at the government GSA per diem rates of S251 and $76. Three project staff and three students will travel to the Human Link lab in Cairo for training in Y1 only. For this travel, flights are estimated at $400 and hotels and meals at the government GSA per diem rates for Cairo, Egypt of S175 for lodging and $98 for meals and incidentals for a seven day trip. We are requesting S3,000 p.a. to cover conference fees along with S500 p.a. for visa fees. For each trip, RT taxi to the airport are estimated at $75 along with $25 per day for in-country taxis.

In total over the course of the project, we are requesting S150,137 in for International Travel.

E. Participant/Trainee Support Costs

No funds are requested for participant or trainee support costs.

F. Other Direct Costs

Materials and Supplies

We will supply the field team with all consumables required to collect samples, including serum tubes, vacutainer holder, needles, syringes, nitrile gloves, cotton swabs, Tyvek suits, goggles, biohazard bags, and sharps containers as well as five tablets ($200 ea.) for data collection at field sites. To ensure cold chain, for field visits outside Amman dry ice is required at a cost of S150 per week. The Princess Haya Biotechnology Center requires the purchase of eyewash bottles in Y1 ($250) and installation of an electronic card reader system ($1,500). We request S73,616 over all years of the project for field supplies.

Laboratory Testing

Our laboratory cost request covers PCR for MERS-CoV and avian influenza as well as serology for MERS-CoV, avian influenza, brucellosis and leptospirosis. Pricing is based on in-house costs on a per test basis. Details on numbers of each test and unit price are provided here for each year that laboratory testing will be conducted, Year 1 Option Year 1. The MERS Serology testing was previously going to be conducted at the Human Link lab in Cairo, Egypt but will now be conducted at the Princess Haya Biotechnology Center in Jordan.

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$
MERS PCR camels	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
AI PCR humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$
AI PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
AI PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
MERS Serology Humans PP	330	$ 40.00	$ 13,200.00	0	$ 40.00	$	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 13,200.00			
MERS Serology camels ELISA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$
AI serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$
AI serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$
AI Serology Subtype Testing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$
Lepto Serowar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$			$			$			$			$
Lepto PCR camels			$			$			$			$			$
Lepto PCR other ruminants			$			$			$			$			$
			$			$			$			$			$
	Y1 Total		$ 53,500.00	Y2 Total		$ 53,500.00	Y3 Total		$ 77,500.00	OY1 Total		$ 66,500.00	OY2 Total		$

Meetings and Conferences

We request support for an annual meeting each year for 45 people including personnel from partner institutions (EHA and JUST) as well as local stakeholders. Travel costs for United States-based participants to attend the annual meeting are covered in the EcoHealth Alliance budget. We estimate that for the one-day meeting, ten Jordanian partners traveling from outside Amman will require transportation (estimated at S60 per person), meals and accommodation to be covered (S246 for lodging and $138 for meals and incidentals). Lunch will be provided for all participants and there will be costs associated with room rental ($1,000 per day), translation and sound equipment to facilitate translation ($2,000 per day) and printing and supplies. Overall costs for the annual meetings are estimated at $12,605 p.a.

In addition to the annual meeting, there will be a Kick Off meeting in Y1 only for 20 participants, five of which will be from outside of Amman. All cost estimates remain the same from the annual meeting, with the Kick Off Meeting estimated at S7,740.

There will be three regional meetings held in Amman in Y2, OY1 and OY2, for which regional transport will be required for two people each from Egypt ($200), Lebanon ($300) and Iraq ($500) as well as meals and accommodation to be covered (S246 for lodging and S138 for meals and incidentals). We will have the same printing, supplies, room rental and translation fees as above and lunch included for 24 participants. For the regional meetings, we request $19,865 each.

A threat reduction workshop in planned for OY2 with transportation and accommodation for ten participants from Jordan and international travel and accommodation for four participants each from Lebanon and Iraq; the workshop will consist of 45 total participants. The costs for flights, accommodation, meals and incidentals, lunch, room rental, and translation services remain the same as mentioned above. The printing and supplies is estimated for this meeting at S1,500 for the printing of booklets and reports. The total cost of this workshop is S45,743.

H. Indirect Costs

We are requesting the federally agreed indirect cost of 8% on all direct costs.

BUDGET JUSTIFICATION FOR HUMAN LINK, LEBANON

Human Link requests a total of $64,850 over all years of the proposed project to support testing and indirect costs.

A. Key Personnel
Ghazi Kayali, Ph.D., Co-Investigator (2 weeks for Y1-OY2). Dr. Kayali will assist in conducting a three day didactic training on biosafety and security, including real-time PCR testing and analysis, influenza subtyping, genomic analysis of MER-CoVs and serology testing and analysis. He will travel to Jordan University of Science and Technology for one week per year to re-train and supervise testing at the Princess Haya Biotechnology Center. For this he will be compensated one week salary, in addition to one week each year to advise on data analysis, interpretation, and publications related to the laboratory work to promote scientific sharing of the laboratory methods to enhance detection capacity, for which we are requesting a total of $7,708 p.a.

B. Other Personnel
No funds are requested for other personnel costs.

C. Equipment
No funds are requested for equipment costs.

D. Travel
In order to conduct the re-training in biosafety, security and laboratory techniques as well as oversee testing, we are requesting $3,103 in international travel to cover the flight from Cairo to Amman (estimated at $400) as well as the federal per diem rates of $246 for lodging in Amman, Jordan and $138 for meals in Amman, Jordan.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

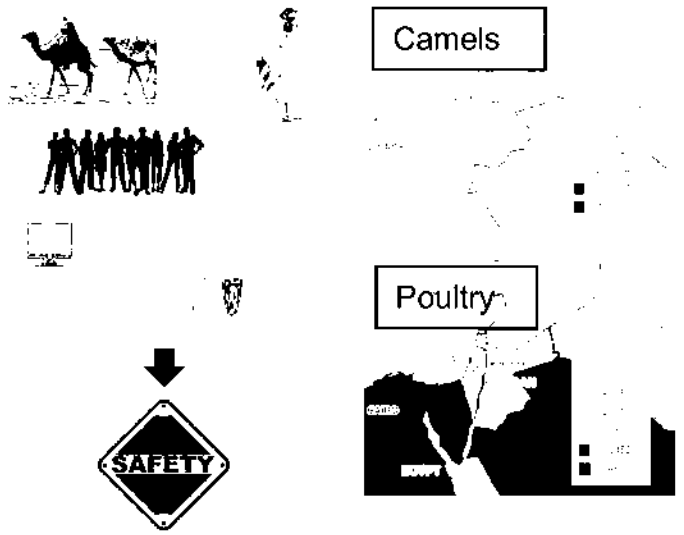
F. Other Direct Costs
Materials and Supplies
Pseudoparticles will be required to conduct the pseudo-particle neutralization assay. These will be prepared in batches in the lab in Cairo and are produced by transfecting HIV and MERS cloning vectors in 293T cells to obtain non-infectious particles displaying the spike protein of MERS. For this we request $2,000 p.a. starting in Y2, when Dr. Kayali will be travelling to Jordan.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 10% on all direct costs.

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan, PI: William B. Karesh, BTRP-TA.6 CC WMD GRANT # 12862917

Objective: Work with government and private sector partners to characterize causal factors in animal-to-human transmission of MERS, AI, and other zoonoses in Jordan, implement serological technology for enhanced diagnostic and detection capabilities, and strengthen regional detection and reporting capacity to reduce biological threats.

Method: Conduct a prospective cohort study at various human-livestock/poultry interfaces across Northern, Middle, and Southern Jordan. Conduct regional collaboration and capacity building workshops in Jordan for Iraqi and Lebanese scientists from Health, Agriculture, and related Ministries and agencies.



Status of effort: Collaborative team working on infectious diseases in humans and animals in place. Established relationships with Ministries, labs, university scientists, poultry industry, camel owners and Bedouin community.

Personnel Supported: 7 University Faculty, 6 Other Scientists, 2 Scientific Advisors, 20 professional students, >24 government workshop participants.

Publications & Meetings: 10 stakeholder/partner meetings and training workshops, 8 scientific publications, >40 conference presentations

Major Goals and Milestones:

- Determine evidence of MERS, AI, and other zoonoses in humans, livestock and poultry in Jordan (Y1-OY2)
- Identify risk factors and modifiable behaviors for threat reduction (Y1-OY2)
- Improve knowledge and diagnostic capacity (Y1-OY2)

Funding Profile Yr 1: $986,585, Yr 2: $981,495, Yr 3: $988,228, OYr 1: $994,751, OYr 2: $947,734

Contact information PI: Dr. William B. Karesh, 212-380-4463 Karesh@ecohealthalliance.org

Statement of Work

Project Title: Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity.

Document Date: 18 March 2020.

Objective: The objective of this grant is to reduce the threat of high-consequence zoonotic pathogens in Jordan and improve regional disease surveillance capacity. Jordan faces risk of several zoonoses of concern to human and animal health, including Middle East Respiratory Syndrome (MERS-CoV) and Avian Influenza (AI), with fundamental knowledge and capacity gaps around the distribution and determinants of zoonoses. Recent work by our team detected MERS-CoV in camels and people in Jordan, suggesting ongoing and unmitigated transmission risk of a priority pathogen. The proposed study will generate critical advances in determining the presence of zoonotic pathogens in the country and opportunities for public health intervention. Through a prospective human cohort study coordinated with animal sampling, we will conduct biological and behavioral surveillance in five regions of Jordan with livestock production interfaces to determine the presence and risk factors for MERS-CoV, AI, brucellosis, and leptospirosis to identify modifiable risk factors. By testing three core policy-relevant hypotheses and providing multi-disciplinary training opportunities, the awardee shall enhance scientific capacity in Jordan and support disease detection and reporting in Jordan, Iraq and Lebanon. Taking a coordinated, multi-hazard approach to threat reduction, the proposed study will add critical understanding of presence and risk factors for zoonotic diseases in Jordan and advance scientific capacity and application of the One Health concept to counter biothreats in the region.

Scope: The awardee proposes a five-year One Health study of zoonotic diseases in Jordan. The awardee team shall focus on the following major goals and milestones:

1) Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and poultry in Jordan: *Implement animal study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

2) Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses: *Implement human cohort study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

3) Characterize causal factors in animal-to-human transmission of these zoonoses: *Implement behavioral risk survey (Y1-OY1); Conduct epidemiological analyses (Y1-OY2)*

4) Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk: *Generate geospatial distribution and risk maps (Y1-OY2)*

5) Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon: *Host workshops (Y1-2, OY1-2); Submit reports and publications (Y1-OY2); Attend presentations/meetings (Y1-OY2)*

6) Identify specific modifiable risk factors for human infection with these zoonoses: *Conduct causal interference analyses (Y3-OY2); Policy recommendations on modifiable risk factors (Y3-OY2)*

This research will generate critical advances in detecting the presence of and exposure risk to high-consequence zoonotic viruses and bacteria across geographic regions and interfaces in Jordan, contributing to enhanced understanding of modifiable risk factors to inform government authorities on prevention activities to reduce disease threats.

Background: Jordan has experienced outbreaks of several high-consequence zoonotic diseases, including MERS-CoV and AI. Since its emergence in 2012, MERS-CoV has resulted in over 2,400 human cases globally and is recognized as a priority disease under the WHO R&D Blueprint. While the first human cases of MERS-CoV were traced back to Jordan, little is known about its underlying and ongoing risk of zoonotic disease in animal populations, particularly around primary transmission risk factors and pathways that precede spread in healthcare settings. MERS-CoV is one of several zoonoses posing threat to animal and human populations in the country. Highly Pathogenic Avian Influenza outbreaks, including subtype H5N1, have been reported, and brucellosis is considered endemic in Jordan, with recurring spillover but inadequate understanding of specific modes of transmission and poor vaccination coverage. While human cases of leptospirosis have not been reported in Jordan to date, high rates of certain Leptospira serovars have been detected in animals. Key questions and capacity gaps hinder understanding of the presence, distribution and risk factors in the country, leaving the country vulnerable to zoonotic biothreats, as well as wider regional gaps in detection and reporting. The threat of zoonotic disease is especially pertinent given the rapidly-growing poultry production industry in Jordan and camel, livestock, and poultry rearing in the region.

Jordan has recently made recent several notable scientific advances in detection of MERS-CoV, generating preliminary data that the proposed project will build on. While camels are the presumptive source of primary human MERS-CoV infections, the exact mechanisms of transmission and the possible role of other livestock species are unclear. Blood samples collected from camels and humans in the northern region of Jordan were positive for MERS-CoV, leading to the first-ever report of this disease to OIE in camels in Jordan in 2016. To date, only few countries have reported virus-positive MERS-CoV test results to the OIE so this is a significant and important step toward improving both MERS-CoV detection and reporting in the Middle East. Studies of zoonotic pathogens in the region to date have largely focused on single sites or interfaces, cross-sectional sampling events, or select taxonomic groups, limiting understanding of causal factors. Research is needed to monitor presence and transmission of zoonotic pathogens spatially, temporally, and by biohazard exposure (e.g. blood, urine, feces, and/or nasal secretions) and practices and conduct epidemiological analyses to identify modifiable risk factors for public health intervention. As a key area of stability in the region, it is crucial to support Jordan's biosurveillance capacity, enable understanding of baseline disease risk to allow differentiation of natural versus nefarious emergence events, and ensure responsible bio-risk management to ethically monitor and reduce disease threats. The country has also recently established a One Health platform that indicates the country's commitment to countering zoonotic disease threats. Given the volume of migration between Jordan and its neighbors, including in animal trade, regional coordination in disease monitoring and threat reduction is a critical component in effectively characterizing and addressing disease risk. This project seeks to fill current capacity gaps to advance Jordan as a leader in scientific research and zoonotic disease management and creating new capacity and scientific collaboration pathways for hypothesis-driven research and zoonotic disease monitoring and threat reduction in the region.

Key references include (additional references can be found in the Project Narrative):

van Doremalen N, Hijazeen ZS, Holloway P, Al Omari B, McDowell C, Adney D, Talafha HA, Guitian J, Steel J, Amarin N, Tibbo M, Abu-Basha E, Al-Majali AM, Munster VJ, Richt JA. High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan. *Vector Borne Zoonotic Dis*. 2017 Feb;17(2):155-159.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, Burbelo PD, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB, Lipkin WI. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. *MBio*. 2014 Feb 25;5(2):e00884-14.

World Health Organization. Joint External Evaluation of IHR Core Capacities of the Hashemite Kingdom of Jordan. Geneva. 2016.

Tasks/Scientific Goals: **(Format: Year #(s). Task #. Subtask#).**

TASK 1: Y1.1-O2.1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.

The awardee shall study presence of MERS-CoV, AI, Brucellosis and Leptospirosis in animals. Sites will be selected in five geographically-representative regions across Jordan: Northern Jordan (Al Ramtha), Middle Jordan (Al Zarqa), and Southern Jordan (Al Karak, Ma'an, and Aqaba). These regions were selected based on preliminary findings by our team and the presence of livestock production activities. Sites in each region shall reflect interfaces with poultry, camels, and other livestock animals are represented (e.g. farms or markets). The awardee shall receive permissions and approvals to work with animals prior to initiating sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 camels, poultry and other livestock quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Y1, Y3, and OY1 during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 animals. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, Brucellosis, and Leptospirosis. Staff training on proper study techniques (e.g. sampling, transport, and laboratory) will occur as detailed in Task 5. This task will contribute to testing the hypothesis that livestock species and poultry in Jordan show evidence of infection with MERS-CoV, AI, and/or other assayed zoonoses, as well as inform type of transmission pathways.

Y1.2.1 Identify sites for project study.

Y1.2.2 Obtain local permissions and approvals to work with animals.

Y1.2.3-O1.2.3 Conduct biological sampling in animals within the study area.

Y1.2.4-O2.2.4 Conduct PCR and/or serology testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 2: Y1.2- OY2.1: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses.

The awardee shall conduct a prospective cohort study of humans to evaluate behavioral and occupational risk factors for zoonotic infectious diseases (MERS-CoV, avian influenza, brucellosis, and leptospirosis) among persons living in Jordan in any of the five study regions. The study will enroll persons regularly working with livestock or poultry or sharing their living areas with these animals as well as persons unexposed to these factors. Sites will be selected as in Task 1 and in surrounding communities to enroll both exposed and unexposed populations. In Year 1, the awardee will receive local permissions and approvals to work with human subjects prior to initiating enrollment and sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 enrolled humans quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Year 1, Year 3, and Option Year 1

during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 humans. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, brucellosis, and leptospirosis (Years 1-4). Biological sampling will be paired with behavioral surveillance data as in Task 3.

Y1.2.1 Identify sites and conduct enrollment for human study component.

Y1.2.2 Obtain local permissions and approvals to work with human subjects.

Y1.2.3-O1.2.3 Conduct biological sampling (nasopharyngeal and oropharyngeal swabs, and/or blood) of in people within the study area.

Y1.2.4-O2.2.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 3: Y1.3-OY2.3: Characterize causal factors in animal-to-human transmission of these zoonoses.

The awardee shall monitor behaviors of persons enrolled in the prospective cohort study (as in Task 2) to identify and characterize causal factors for animal-to-human transmission of MERS-CoV, AI, brucellosis and leptospirosis. The PREDICT-2 Human Behavioral Risk Questionnaire will be augmented with animal-specific exposure frequency questions to collect demographic data, symptom and medical history data, social history data, and specific animal-related behaviors and practices that are possible risk factors for infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. The project team will administer the survey to enrolled participants at the first sampling visit (Year 1). During all future visits (Year 1- Option Year 1), enrolled participants will be administered a brief follow-up questionnaire designed primarily to capture time-varying exposure and covariate data. This longitudinal information will provide critical information about the context of exposures and pathways to link biological sampling and provide the wider context of practices and risk factors. Epidemiologic analysis of the questionnaire data (including time-varying data) in this Task will identify current practices and exposure pathways and initial modifiable risk factors. Specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) will be assessed under Task 6 for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. Results will be shared via annual reports and stakeholder meetings as in Task 5.

Y1.3.1 Obtain local permissions and approvals to work with human subjects.

Y1.3.2-O1.3.2 Conduct behavioral risk factor surveys in people.

Y1.3.3-O2.3.3 Analyze epidemiologic causal inference to identify modifiable risk factors.

TASK 4: Y1.4-OY2.4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.

The awardee shall map findings from Tasks 1-2 to show the distribution of detected pathogens across the regions and sampling sites. Geospatial mapping is a highly relevant visual tool to assist authorities in targeting surveillance and risk management activities. Using QGIS, laboratory results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and mapped to show the distribution of detected pathogens. Maps will be generated beginning Y1, Q3 when laboratory findings are available. Geospatial risk maps will be generated using statistical models to link human behavioral data to laboratory findings beginning in Y1, Q4. Geospatial maps will be updated quarterly and shared with USG/DTRA and Jordanian project partners. Training on geospatial analysis will be provided to project team

members and will be covered under a regional workshop to promote broader uptake of geospatial mapping as a low-cost tool to enhance disease monitoring programs in the region (Task 5).

Y1.4.1-O2.4.1 Generate maps of laboratory results

Y2.4.2-O2.4.2 Generate risk maps of human behavioral risk data

TASK 5: Y1.5-OY2.5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.

Strengthening disease detection and reporting capacity is a key contributor to health security and the ability to target risk factors for threat reduction. The project team is committed to improving this capacity in Jordan as well as more widely in the region through involvement of scientists and government officials in Iraq and Lebanon. We will train local staff in proper techniques for all project activities (Year 1 and Option Year 1). Each year we will support four students from medical and veterinary disciplines in Jordan to participate in training, field activities, project analyses and workshops to provide scientific mentorship and promote the One Health concept. Jordanian scientists and students will also be trained in laboratory techniques to be deployed in Jordan by the Human Link laboratory consultant that has led capacity development for MERS-CoV diagnostics in other countries. The awardee shall organize workshops in Jordan open to scientists from the Ministries of Health and Agriculture from Jordan, Iraq, and Lebanon (Years 1-2, Option Years 1-2). A secure project database will be developed for use in the epidemiological analyses. The awardee shall provide submission of annual sample repository information using a DTRA-specified format and shall grant access to all samples collected and data generated during the course of the project, up to and including at least 12 months after the project end date. The awardee shall conduct presentations/meetings at times and places specified in the grant schedule (Year 1 Task 5), including the DTRA Annual Technical Review. In Year 1 the awardee shall hold a kick-off meeting to introduce the project objectives and promote buy-in in study findings and capacity sustainment. Annual reports and stakeholder meetings and scientific presentations and publications will be used to disseminate results. The project will reinforce Jordan's national One Health platform, promoting the One Health concept for multiple diseases of concern for public and animal health and advancing capacity for hypothesis-driven research with direct application for policy decisions for threat reduction.

Y1.5.1 Conduct project kick-off meeting in Amman with local stakeholders.

Y1.5.2 & O1.5.2 Train local project staff in proper techniques.

Y1.5.3-O2.5.3 Host annual partners and stakeholders meeting.

Y1.5.4-O2.5.4 Complete annual report and share with project partners and local stakeholders.

Y1.5.5-Y2.5.5 & O1.5.5-O2.5.5 Conduct local/regional training workshops.

Y1.5.6- O2.5.6 Data management.

Y1.5.7- O2.5.7 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

TASK 6: Y3.6-OY2.6: Identify specific modifiable risk factors for human infection with these zoonoses.

The awardee shall integrate the findings of the biological testing (animal and human) and behavioral surveys in Tasks 1-3, assessing specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions)

for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. These potential modifiable risk factors will be determined through epidemiologic analysis of the questionnaire data (including time-varying data) paired with individual laboratory results (e.g., detection of viral RNA, bacterial DNA, or antibodies). Using quarterly, longitudinal data collected in Tasks 1-3, we will examine any major temporal dynamics that may be associated with elevated transmission risk (e.g. seasonality, animal birthing periods). Causal inference techniques within the potential outcomes framework will be employed to solidify statistical associations as concretized biological/clinical/environmental pathways by operationalizing exposures as well-defined interventions and ensuring exchangeability is maintained through confounder control informed by directed acyclic graphs of the conceptual exposure-disease pathways. The awardee will examine multiple zoonotic pathogens (as above) to inform general threat reduction guidelines. Identification of modifiable risk factors will inform intervention development that may interrupt future zoonotic transmission of the four pathogens in this study. Findings will be shared with USG/DTRA and the Jordanian Ministry partners at the annual stakeholders meetings, the threat reduction workshop, scientific presentations and publications as specified in Task 5. This information will provide a strong basis for potential policy guidance and the generation of solutions at the threat reduction workshop in OY2.

Y3.6.1-O2.6.1 Conduct causal inference analyses bases on Tasks 1, 2, 3.
Y3.6.2-O2.6.2 Share results of analyses at annual partners and stakeholders meeting.
Y3.6.3 & O2.6.3 Submit written report to DTRA and local partners and stakeholders.

Performance Schedule:

Task	Year 1	Year 2	Year 3	OY 1	OY 2
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan					
1.1. Identify sites for project study					
1.2 Obtain local permissions and approvals to work with animals					
1.3 Conduct biological sampling in animals within the study area					
1.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection					
2.1 Identify sites and conduct enrollment for human study component					
2.2 Obtain local permissions and approvals to work with human subjects					
2.3 Conduct biological sampling					
2.4 Conduct testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses					
3.1 Obtain local permissions and approvals to work with human subjects					
3.2 Conduct behavioral risk factor surveys in people					
3.3 Analyze epi causal inference to identify modifiable risk factors					
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk					
4.1 Generate maps of laboratory results					
4.2 Generate risk maps with human beh. risk data					
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon					
5.1 Conduct project kick-off meeting in Amman with local stakeholders					
5.2 Train local project staff in proper techniques					
5.3 Host annual partners and stakeholders meeting					
5.4 Complete annual report and share with partners and stakeholders					
5.5 Conduct local/regional training workshops					
5.6 Data management					
5.7 Conduct presentations/meetings at times and places specified					
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses					
6.1 Conduct causal inference analyses based on Task 1, 2, 3					
6.2 Share results of analyses at annual partners and stakeholders meeting					
6.3 Submit written report to DTRA and local partners and stakeholders					

OMB Number: 4040-0001
Expiration Date: 12/31/2022

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION
☐ Pre-application ☒ Application ☐ Changed/Corrected Application

2. DATE SUBMITTED | **Applicant Identifier**

4. a. Federal Identifier

b. Agency Routing Identifier GRANT12862917

c. Previous Grants.gov Tracking ID GRANT12925672

5. APPLICANT INFORMATION

Organizational DUNS: 077090660000

Legal Name: EcoHealth Alliance
Department:
Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York
County / Parish:
State: NY: New York
Province:
Country: USA: UNITED STATES
ZIP / Postal Code: 10001-2320

Person to be contacted on matters involving this application

Prefix: Dr.
First Name: William
Middle Name:
Last Name: Karesh
Suffix:
Position/Title: Executive Vice President of Health and Policy
Street1: 460 W 34th St
Street2: 17th Floor
City: New York
County / Parish:
State: NY: New York
Province:
Country: USA: UNITED STATES
ZIP / Postal Code: 10001 2320
Phone Number: 212-380-4463
Fax Number: 212-380-4465
Email: karesh@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION *(EIN) or (TIN):* 311726494

7. TYPE OF APPLICANT: M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)
Other (Specify):
Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION:
☒ New ☐ Resubmission
☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).
☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration
☐ E. Other (specify):

Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. NAME OF FEDERAL AGENCY: Defense Threat Reduction Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 12.351
TITLE: Scientific Research: Combating Weapons of Mass Destruction

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity

12. PROPOSED PROJECT:
Start Date: 09/01/2020
Ending Date: 08/31/2025

13. CONGRESSIONAL DISTRICT OF APPLICANT
NY-010

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name: William Middle Name:
Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy
Organization Name: Ecohealth Alliance
Department: Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4463 Fax Number:
Email: karesh@ecohealthalliance.org

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	4,898,794.08
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	4,898,794.08
d. Estimated Program Income	0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR
☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ I agree

**The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL (Disclosure of Lobbying Activities) or other Explanatory Documentation

Add Attachment

19. Authorized Representative

Prefix: Dr. First Name: Aleksei Middle Name:
Last Name: Chmura Suffix:
Position/Title: Authorized Organizational Representative
Organization: Ecohealth Alliance
Department: Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4473 Fax Number:
Email: chmura@ecohealthalliance.org

Signature of Authorized Representative: Aleksei Chmura

Date Signed: 03/18/2020

20. Pre-application Add Attachment

21. Cover Letter Attachment 1266-DTRA Jordan Cover Letter_FINAL.pdf Delete Attachment View Attachment

RESEARCH & RELATED Other Project Information

OMB Number: 4040-0001
Expiration Date: 12/31/2022

1. Are Human Subjects Involved? ☒ Yes ☐ No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

If no, is the IRB review Pending? ☐ Yes ☒ No

IRB Approval Date: 09/01/2020

Human Subject Assurance Number:

2. Are Vertebrate Animals Used? ☒ Yes ☐ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☐ Yes ☒ No

IACUC Approval Date: 09/01/2020

Animal Welfare Assurance Number: A4059

3. Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. Does this Project Have an Actual or Potential Impact - positive or negative - on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. Does this project involve activities outside of the United States or partnerships with international collaborators? ☒ Yes ☐ No

6.a. If yes, identify countries: Jordan, Egypt

6.b. Optional Explanation:

7. Project Summary/Abstract	1262-Publicly releasable abstract Jor		Delete Attachment	View Attachment
8. Project Narrative	1263-Jordan_Techical Narrative_Resubm		Delete Attachment	View Attachment
9. Bibliography & References Cited	1264-References_FINAL.pdf		Delete Attachment	View Attachment
10. Facilities & Other Resources	1265 DTR Jordan Facilities_FINAL.pdf		Delete Attachment	View Attachment
11. Equipment		Add Attachment		
12. Other Attachments	Add Attachments			

OMB Number: 4040-0001
Expiration Date: 12/31/2022

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Dr. * First Name: William Middle Name:
* Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34 St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 212 380 4463 Fax Number:
* E-Mail: karesh@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** PD/PI **Other Project Role Category:**

Degree Type: DVM
Degree Year: 1982

***Attach Biographical Sketch**	1234-Karesh_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1235-Karesh_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 1

Prefix: Ms. * First Name: Catherine Middle Name:
* Last Name: Machalaba Suffix:
Position/Title: Policy Advisor and Research Scientist Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 212 380 4472 Fax Number:
* E-Mail: machalaba@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: MPH
Degree Year: 2009

Attach Biographical Sketch	1236-Machalaba_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1237-Machalaba_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 2

Prefix: Dr. * First Name: Ehab Middle Name:

* Last Name: Abu-Basha Suffix:

Position/Title: Country Coordinator Department:

Organization Name: USAID EPT PREDICT 2 Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: abubasha@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2002

Attach Biographical Sketch	1238-Abu-Basha_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1239-Abu-Basha_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 3

Prefix: Dr. * First Name: Ghazi Middle Name:

* Last Name: Kayali Suffix:

Position/Title: Chief Executive Officer Department:

Organization Name: Human Link Division:

* Street1: Said Freiha Street

Street2:

* City: Hazmieh County/ Parish:

* State: Province:

* Country: LBN: LEBANON * Zip / Postal Code:

* Phone Number: +961 5 45 42 52 Fax Number: +961 5 45 80 45

* E-Mail: ghazi@human-link.org

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2008

Attach Biographical Sketch	1240 Kayali_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1241 Kayali_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 4

Prefix: Dr. | * First Name: Patrick | Middle Name:

* Last Name: Dawson | Suffix:

Position/Title: Epidemic Intelligence Service Officer | Department: Nat Ctr for Emerging & Zoonoti

Organization Name: Centers for Disease Control and Prevention | Division: Div of High Consequence Pathog

* Street1: 1600 Clifton Road

Street2:

* City: Atlanta | County/ Parish:

* State: GA: Georgia | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 30329-4027

* Phone Number: 848 888 2402 | Fax Number:

* E-Mail: patrick.t.dawson@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co-Investigator | **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2019

Attach Biographical Sketch	1242-Dawson_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1243-Dawson_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 5

Prefix: Ms. | * First Name: Emily | Middle Name:

* Last Name: Hagan | Suffix:

Position/Title: Behavioral Risk Prograr Manager | Department:

Organization Name: EcoHealth Alliance | Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York | County/ Parish:

* State: NY: New York | Province:

* Country: USA: UNITED STATES | * Zip / Postal Code: 10001 2320

* Phone Number: 212-380-4491 | Fax Number:

* E-Mail: hagan@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) | **Other Project Role Category:** Behavioral Risk Scientist

Degree Type: MPH

Degree Year: 2013

Attach Biographical Sketch	1244 Hagan_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1245 Hagan_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 6

Prefix: Dr. * First Name: Mustafa Middle Name:

* Last Name: Ababneh Suffix:

Position/Title: Faculty Department: Dept of Basic Medical Science

Organization Name: Jordan University of Science & Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +96202720100 Fax Number:

* E-Mail: ababnem@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Virologist

Degree Type: PhD

Degree Year: 2005

Attach Biographical Sketch	1246-Ababneh_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1247-Ababneh_C&P .pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 7

Prefix: Dr. * First Name: Mch'd Borhan Middle Name:

* Last Name: Al Zghoul Suffix:

Position/Title: Vice Dean Department: Dept. Basic Medical Vet Sci

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +96202720100 Fax Number:

* E-Mail: alzghoul@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Molecular Biologist

Degree Type: PhD

Degree Year: 2003

Attach Biographical Sketch	1248 Al Zghoul_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1249 Al Zghoul_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 8

Prefix: Mr. * First Name: Ilani Middle Name:

* Last Name: Talafha Suffix:

Position/Title: Director of Research Services Department:

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: hanit@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Biologist

Degree Type: MS

Degree Year: 2006

Attach Biographical Sketch	1250-Talafha_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1251-Talafha_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 9

Prefix: Mr. * First Name: Zaidoun Middle Name:

* Last Name: Hijazeen Suffix:

Position/Title: National Consultant Department:

Organization Name: Food and Agriculture Organization Division:

* Street1: Al-Sha'b St

Street2:

* City: Amman County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +96265562554 Fax Number:

* E-Mail: zaidoun.hijazeen@fao.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Veterinarian

Degree Type: MS

Degree Year: 2012

Attach Biographical Sketch	1252 Hijazeen_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1253 Hijazeen_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 10

Prefix: Dr. * First Name: Wail Middle Name:

* Last Name: Hayajneh Suffix:

Position/Title: Chairman Department: Infectious Diseases Committee

Organization Name: Jordan Food and Drug Administration Division:

* Street1: 11181

Street2:

* City: Amman County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +9626563200C Fax Number:

* E-Mail: wialh@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Human Infectious Diseases Expert

Degree Type: MBBS

Degree Year: 1991

Attach Biographical Sketch	1254-Hayajneh_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1255-Hayajneh_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 11

Prefix: Mr. * First Name: Zuhair Middle Name:

* Last Name: Bani Israil Suffix:

Position/Title: Professor Department: Dept. of Clinical Vet Med Sci

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962C272C1CCC Fax Number:

* E-Mail: zuhair72@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Livestock Infectious Disease Expert

Degree Type: BS

Degree Year: 1995

Attach Biographical Sketch	1256 Israil_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1257 Israil_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 12

Prefix: Mr. * First Name: Bilal Middle Name:

* Last Name: Al-Omari Suffix:

Position/Title: Supervisor of the Diagnostic Laboratory, Department: Veterinary Health Center

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: bilal@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Laboratory Supervisor

Degree Type: BSc

Degree Year: 1990

Attach Biographical Sketch	1258-Al Omari_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1259-Al-Omari_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 13

Prefix: Dr. * First Name: Whitney Middle Name:

* Last Name: Bagge Suffix:

Position/Title: Disease Ecologist Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001 2320

* Phone Number: 212-380-4468 Fax Number:

* E-Mail: bagge@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Modeler

Degree Type: PhD

Degree Year: 2017

Attach Biographical Sketch	1260 Bagge_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1261 Bagge_C&P.pdf		Delete Attachment	View Attachment

William B. Karesh
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: karesh@ecohealthalliance.org

Professional Preparation

Clemson University	Biology	BS	1977
Univ. of Georgia	Veterinary Medicine	DVM	1982
Zool. Society of San Diego	Residency – Wildlife Health		1982 - 1984

Appointments

Life Member, Council on Foreign Relations	2016 - present
Emerging Pandemic Threats Partner Liaison, USAID EPT PREDICT-2	2014 - present
Advisor, WHO Expert Panel on MERS-CoV	2013 - present
Expert, WHO International Health Regulation Roster of Experts	2013 - present
Executive Vice President for Health & Policy, EcoHealth Alliance	2010 - present
President, Working Group on Wildlife Diseases, OIE, France	2008 - present
Co-Chair, Wildlife Health Specialist Group, IUCN, Switzerland	2001 - present
Chief Technical Officer, USAID EPT PREDICT	2009 - 2014
Chief of Party, USAID Global Avian Influenza Network for Surveillance	2006 - 2009
Vice President & Director, Global Health Programs, Wildlife Cons. Society	2001 - 2010

Publications

Kandeil A, Gomaa M, Shehata M, El Taweel AN, Mahmoud SH, Bagato O, Moatasim Y, Kutkat O, Kayed AS, *Dawson P*, Oui X, Bahl J, Webby RJ, Karesh WB, *Kayali G*. (2019) Isolation and characterization of a distinct influenza A virus from Egyptian bats. **Journal of Virology** 93(2).

Anthony SJ, Johnson CK, Grieg D, Kramer S, Che X, Wells HL, Hicks AL, Joly D, Wolfe ND, Daszak P, Karesh WB, Lipkin WI, Morse SS, Predict Consortium, Mazet J, Goldstein T. (2019) Global patterns in coronavirus diversity. **Virus Evolution** 3(1).

Machalaba CC, Elwood SE, Forcella S, Karesh WB. Global avian influenza surveillance in wild birds: A strategy to capture viral diversity. (2015) **Emerging Infectious Diseases** 21(4):e1-7.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB, Lipkin WI. (2014) Middle East Respiratory Syndrome Coronavirus infection in dromedary camels in Saudi Arabia. **mBio** 5(2):e00884-14.

Karesh WB, Dobson A, Lloyd-Smith JO, Lubroth J, Dixon MA, Bennett M, Aldrich S, Harrington T, Formenty P, Loh EH, *Machalaba CC*, Thomas MJ, Heymann DL. (2012) Ecology of zoonoses: Natural and unnatural histories. **The Lancet** 380(9857):1936-45.

Gaidet N, Caron A, Cappelle J, Cumming GS, Balanca G, Hammoumi S, Cattoli G, Abolnik C, De Almeida RS, Gil P, Fereidouni SR, Grosbois V, Tran A, Mundava J, Fofana B, El Mamy ABO, Ndlovu M, Mondain-Monval JY, Triplet P, Hagemeijer W, Karesh WB, Newman SH, Dodman T. (2012) Understanding the ecological drivers of avian influenza virus infection in wildfowl: A continental-scale study across Africa. **Proceedings of the Royal Society B: Biological Sciences** 279(1731):1131-41.

Morse SS, Mazet JAK, Woolhouse M, Parrish CR, Carroll D, Karesh WB, Zambrana-Torrelio C, Lipkin WI, Daszak P. (2012) Prediction and prevention of the next pandemic zoonosis. **The Lancet** 380:1956-65.

Current and Pending Support

Investigator: William Karesh

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA
Total Award Amount: $4,898,795 Total Award Period Covered: 09/01/2020 - 8/31/2025
Location of Project: USA, Jordan
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding the Risk of Bat-Bourne Zoonotic Disease Emergence in Western Asia

Source of Support: DTRA
Total Award Amount: $4,391,443.65 Total Award Period Covered: 10/02/2017 - 10/01/2022
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.25 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,988,526 Total Award Period Covered: 06/01/2019 - 05/31/2024
Location of Project: USA, South Africa
Person-Months Per Year Committed to the Cal: 0.75 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
READY: Augmenting Capacity for Humanitarian Emergencies of Infectious Diseases with Epidemic or Pandemic Potential

Source of Support: USAID
Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018 - 09/30/2021
Location of Project: Global
Person-Months Per Year Committed to the Cal: 1.5 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
One Health Workforce

Source of Support: USAID
Total Award Amount: $4,600,000 Total Award Period Covered: 10/01/2019 – 9/31/2024
Location of Project: Global
Person-Months Per Year Committed to the Cal: 3.5 Acad: Sumr:

USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

Investigator: William Karesh

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/01/2019 - 07/31/2024
Location of Project: USA, Tanzania
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Reducing the Threat from high-risk pathogens causing febrile illness in Liberia

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 06/01/2020 - 05/31/2024
Location of Project: USA, Liberia
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

USE ADDITIONAL SHEETS AS NECESSARY

Hani A. M. Talafha
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: hanit@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Ag. Sci.; Ani. Prod.	BS	1998
The University of Sydney	Animal Science	MS	2006

Appointments

Director of Research Services and Lecturer, JUST	2017 - present
Field Coordinator Jordan, EPT PREDICT-2	2016 - 2019
Head, Auditing and Monitoring of Research, Deanship of Research, JUST	2016 - 2017
Lecturer and Lab Supervisor, JUST	2011 - 2016
Lab Supervisor, Center for Extension and Livestock Research, JUST	2008 - 2011
Lab Technician, JUST	2000 - 2004
Research Assistant, JUST	1998 - 2000

Publications

Dawson P, *Abu-Basha E*, Amarneh B, Fahmawi A, Alshammari A, Alzaqa E, *Hijazeen Z*, Talafha H, *Omari B*, *Al-Zghoul MB*, *Ababneh M*, *Ismail ZB, Karesh WB*. (2019) Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human disease risks among persons at camel farms, abattoirs, and meat markets in Jordan. **International Journal of Infectious Diseases** 79(1):63–64.

van Doremalen N, *Hijazeen ZSK*, Holloway P, *Al-Omari B*, McDowell C, Adney D, Talafha HA, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2016) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne and Zoonotic Diseases** 17(2):155-159.

Jawasreh KIZ, AL-Rawashdeh IM, Al-Majali A, Talafha H, Eljarah A, Awawdeh F. (2011) Genetic 13 relatedness among Jordanian local Awassi linens Baladi, Saqri, and Blackface and the Najdi breed using RAPD analysis. **Genomics and Quantitative Genetics** 2:31-36.

Al-Majali AM, Jawasreh K, Talafha H. (2008) Epidemiology of Neoporosis in sheep and different breeds of goats in Jordan. **American Journal of Animal and Veterinary Science** 3:47-52.

Haddad SG, Mahmoud KZ, Talafha HA. (2005) Effect of varying levels of dietary undegradable protein on nutrient intake, digestibility and growth performance of Awassi lambs fed on high wheat straw diets. **Small Ruminant Research** 58(3):231-236.

Moh'd Borhan Al-Zghoul
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: alzghoul@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1996
Purdue University	Immunology	MS	2000
Purdue University	Mole. and Dev. Biology	PhD	2003

Appointments

Vice Dean, Department of Basic Medical Veterinary Sciences, JUST	2018 - present
Assistant Dean, Department of Basic Medical Veterinary Sciences, JUST	2016 - 2017
Head, Department of Basic Medical Veterinary Sciences, JUST	2008 - 2010

Publications

Al-Zghoul M B, Saleh KM, *Ababneh MMK*. (2019) Effects of pre-hatch thermal manipulation and post-hatch acute heat stress on the mRNA expression of interleukin-6 and genes involved in its induction pathways in 2 broiler chicken breeds. **Poultry Science** 98(4):1805-1819.

Al-Zghoul MB, Sukker H, *Ababneh MM*. (2019) Effect of thermal manipulation of broilers embryos on the response to heat-induced oxidative stress. **Poultry Science** 98(2):991-1001.

Al-Zghoul MB, Al-Natour MQ, Dalab AS, Alturki OI, Althnaian TA, Al-ramadan YS, Hannon KM. (2016) Thermal manipulation mid-term broiler chicken embryogenesis: Effect on muscle growth factors and muscle marker genes. **Brazilian Journal of Poultry Science** 18(4):607-618.

Ababneh M, Dalab A, Alsaad S, Al-Zghoul MB. (2012) Presence of infectious bronchitis virus strain CK/CH/LDL/97I in the Middle East. **ISRN Veterinary Science**

Ababneh MM, Al-Rukibat RK, Hananeh WM, Nasar AT, Al-Zghoul MB. (2012) Detection and molecular characterization of bovine leukemia viruses from Jordan. **Archives of Virology** 157:2343-2348.

Ababneh MMK, Dalab AE, Alsaad SR, Al-Zghoul MB, Al-Natour MQ. (2012) Molecular characterization of a recent Newcastle disease virus outbreak in Jordan. **Research in Veterinary Science** 93:1512-1514.

Mustafa Ababneh
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: ababnem@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1999
Purdue University	Veterinary Microbio./Viro.	PhD	2001 - 2005

Appointments

Faculty, Department of Basic Medical Sciences, JUST	2005 - present
Post-doctoral Fulbright Fellow, University of Georgia	2015 - 2016
Assistant Dean, JUST	2009 - 2010
Post-doctoral Fellow, John Curtin Sch. of Med. Res., Australian Nat'l Uni.	2008 - 2009

Publications

Ababneh M, Ferreira HL, Khalifeh M, Suarez DL, Afonso CL. (2018) First genome sequence of Newcastle disease virus of genotype VIII from Jordan. **Microbiology Resource Announcement** 7(23):e01136-18.

Wajid A, Dimitrov KM, Wasim M, Rehmani SF, Basharat A, Bibi T, Arif S, Yaqub T, Tayyab M, Ababneh M, Sharma P, Miller PJ, Afonso CL. (2017) Repeated isolation of virulent Newcastle disease viruses in poultry and captive non-poultry avian species in Pakistan from 2011 to 2016. **Preventative Veterinary Medicine** 142:1-6.

Hananeh WM, Momani WM, Ababneh MM, Abutarbush SM. (2018) Mycoplasma bovis arthritis and pneumonia in calves in Jordan: An emerging disease. **Veterinary World** 11(12):1663-1668.

Reusken C, Ababneh M, Raj V, Meyer B, Eljarah A, Abutarbush S, Godeke G, Bestebroer T, Zutt I, Muller M, Bosch B, Rottier P, Osterhaus A, Drosten C, Haagmans B, Koopmans M. (2013) Middle East Respiratory Syndrome Coronavirus (MERS-CoV) serology in major livestock species in an affected region in Jordan, June to September 2013. **Euro Surveillance** 18(50).

Abutarbush SM, Ababneh MM, Al Zoubi IG, Al Sheyab OM, Al Zoubi MG, Alekish MO, Al Gharabat RJ. (2013) Lumpy Skin Disease in Jordan: Disease emergence, clinical signs, complications and preliminary-associated economic losses. **Transboundary and Emerging Diseases** 62(5):549-554.

Al-Zhgoul MB, Dalab AE, Ababneh MM, Jawasreh KI, Al Busadah KA, *Ismail ZB*. (2013) Thermal manipulation during chicken embryogenesis results in enhanced Hsp70 gene expression and the acquisition of thermotolerance. **Research in Veterinary Science** 95(2):502-507.

Ababneh MM, Hananeh WM, Dalab AE. (2012) Molecular and histopathological characterization of sheep-associated malignant catarrhal fever (SA-MCF) outbreak in beef cattle. **Transboundary and Emerging Diseases** 6(1):75-80.

Ababneh MM, Al-Rukibat RK, Hananeh WM, Nasar AT, *Al-Zghoul MB*. (2012) Detection and molecular characterization of bovine leukemia viruses from Jordan. **Archives of Virology** 157(12):2343-8.

Eljarah A, *Al-Zghoul MB*, Jawasreh K, Ababneh M, Alsumadi M, Alhalah A, *Ismail ZB*. (2012) Characterization of male reproductive anatomy of the endangered Arabian oryx (*Oryx leucoryx*). **Theriogenology** 78(1):159-64.

Emily A. Hagan
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: hagan@ecohealthalliance.org

Professional Preparation

Hiram College, OH	Bio., Biomed. Humanities	BS	2008
Columbia University, NY	Epidemiology	MPH	2013

Appointments

Research Scientist, EcoHealth Alliance	2016 - present
PREDICT Bangladesh Country Liaison, EcoHealth Alliance	2016 - present
Research Coordinator, EcoHealth Alliance	2015 - 2016
Research Assistant, EcoHealth Alliance	2013 - 2015
Team Manager, Beth Israel Deaconess Medical Center	2011 - 2012
Research Assistant, Beth Israel Deaconess Medical Center	2008 - 2012
Teaching Assistant, Hiram College Organic Chemistry Department	2007 - 2008
NSF REU Research Intern, University of Akron, Polymer Department	2007 - 2007
Researcher, Hiram College Cellular and Molecular Lab	2006 - 2007

Publications

Wang N, Li S, Yang X, Huang H, Zhang Y, Guo H, Luo C, Miller M, Zhu G, Chmura AA, Hagan E, Zhou J, Zhang Y, Wang L, Daszak P, Shi Z (2018) Serological evidence of bat SARS- related coronavirus infection in humans, China. **Virologica Sinica** 33(1):104-107.

Miller M, Hagan E (2017) Integrated biological behavioural surveillance in pandemic-threat warning systems. **Bulletin of the World Health Organization** 95(1):62.

Mazet JAK, Wei Q, Zhao G, Cummings D, Desmond JA, Rosenthal J, King CH, Cao, Wuchun, Chmura A, Hagan EA, Zhang S, Xiao X, Xu JA, Zhengli S, Liu X, Pan W, Zhu GA, Zuo L, Daszak P. (2015) Joint China–US Call for an Interdisciplinary Approach to Emerging Infectious Diseases. **EcoHealth** 12(50).

Schmitz JE, Ma ZM, Hagan EA, Wilks AB, Furr KL, Linde CH, Zahn RC, Brenchley JM, Miller CJ, Permar SR. (2012) Memory CD4+ T lymphocytes in the gastrointestinal tract area major reservoir of simian immunodeficiency virus in chronic nonpathogenic infection of African green monkeys. **Journal of Virology** 86(20):11380-5.

Finstad S, Zhang G, Jin C, Linde C, Hagan EA, de la Rosa M, Zahn RC, Wang X, Reimann K, Gaufin T, Apetrei C, Pandrea I, Miller CJ, McCune J, Picker LJ, Lifson J, Piatak M, Alter G, Veazey RS, Barouch D, Hessell AJ, Burton DR, Nimmerjahn F, Alexander F, Alam SM, Haynes B, Gelman R, Brusic V, Letvin N, Schmitz JE. (2010) Effect of Fc gamma-r receptor polymorphisms in rhesus macaques on SIVmac251 setpoint viremia. **AIDS Research and Human Retroviruses** 26(10):A20-A20.

Niewiarowski PH, Lopez S, Ge L, Hagan E, Dhinojwala A. (2008) Sticky gecko feet: The role of temperature and humidity. **PLoS ONE** 3(5) e2192.

Patrick T. Dawson
Centers for Disease Control and Prevention (CDC), 1600 Clifton Road, Atlanta, GA 30329
E-mail: patrick.t.dawson@gmail.com

Professional Preparation

Northwestern University	Biological Sciences	BA	2010
Columbia University	Epidemiology	MPH	2012
Columbia University	Epidemiology	PhD	2019

Appointments

Epidemic Intelligence Service Officer, CDC	2019 - present
Research Scientist, EcoHealth Alliance, New York, NY	2016 - 2019
Teaching Assistant, Columbia University Mailman School of Public Health	2014 - 2019
Regional Epidemiologist, U.S. CDC, Egypt	2012 - 2014
Epi Scholar, New York City Department of Health and Mental Hygiene	2011 - 2012
Research Assistant, Columbia University Mailman School of Public Health	2010 - 2012
Intern, EdgeAlliance AIDScare Progressive Services	2009 - 2010
Intern, Bayshore Hospital, Holmdel, NJ	2007 - 2009

Publications and Presentations

Kandeil A, Gomaa MR, Shehata MM, El Taweel AN, Mahmoud SH, Bagato O, Moatasim Y, Kutkat O, Kayed AS, Dawson P, Qui X, Bahl J, Webby RJ, *Karesh WB*, *Kayali G*, Ali MA (2018) Isolation and characterization of a distinct influenza A virus from Egyptian bats. **Journal of Virology** 93(2):e01059-18.

Dawson P, *Abu-Basha E*, *Amarneh B*, Fahmawi A, Alshammari A, Alzaqa E, *Hijazeen Z*, *Talafha H, Omari B, Al-Zghoul B, Ababneh M, Ismail ZB, Karesh WB* (2018). Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human hisease risks in Jordan. **International Meeting on Emerging Diseases and Surveillance (IMED)**, Vienna, Austria (poster).

Dawson P, *Karesh WB*, Kandeil A, Sayed A, Ali MA, *Kayali G.* (2018) Identifying behavioral risk intervention points to prevent zoonotic spillover at animal markets, farms, and abattoirs in Egypt. **18th International Congress on Infectious Diseases**, Buenos Aires, Argentina (oral presentation, Zoonoses & One Health).

Abdallat M, Dawson P, Haddadin AJ, El-Shoubary W, Dueger E, Sanouri T, Said MM, Talaat M. (2016) Influenza hospitalization epidemiology from a Severe Acute Respiratory Infection surveillance system in Jordan, January 2008 February 2014. **Influenza and Other Respiratory Viruses** 10(2):91-7.

Dawson P, Perri BR, Ahuja SD. (2016) High tuberculosis strain diversity among New York City public housing residents. **American Journal of Public Health** 106(3):563-8.

Kandeel A, Dawson P, Labib M, Said M, Refaey S, Naguib A, Talaat M. (2016) Morbidity, mortality, and seasonality of influenza hospitalizations in Egypt, November 2007-November 2014. **PLOS ONE** 11(9):e0161301.

Ghazi Kayali
Human Link, Camelia 2 bldg, Said Freiha Street, Hazmieh, Baabda 1109, Lebanon
E-mail: ghazi@human-link.org

Professional Preparation

American University of Beirut	Environmental Health	BS	1996
American University of Beirut	Epidemiology & Biostats.	MPH	1998
University of Iowa	Epidemiology	PhD	2008

Appointments

Associate Editor, BMC Infectious Diseases	2019 - present
Chief Executive Officer, Human Link, Lebanon	2016 - present
Expert, WHO International Health Regulation Roster of Experts	2014 - present
Advisor, WHO EMRO, PIP, One Health, Zoonoses	2011 - present
Staff Scientist, St. Jude Children's Research Hospital	2014 - 2016
Postdoc Fellow, St. Jude Children's Research Hospital	2008 - 2014
Research Assistant, Department of Epidemiology, University of Iowa	2005 - 2008
Environmental Health Specialist, King Abdulaziz Medical City, Saudi Arabia	2001 - 2005

Publications

Kandeil A, Gomaa M, Shehata M, El-Taweel A, Kayed AE, Abiadh A, Jrijer J, Moatasim Y, Kutkat O, Bagato O, Mahmoud S, Mostafa A, El-Shesheny R, Perera RA, Ko RL, Saad A, McKenzie PP, Webby RJ, Peiris M, Ali MA, Kayali G. (2019) Middle East Respiratory Syndrome Coronavirus infection in non-camelid domestic mammals. **Emerging Microbes & Infections** 8(1):103-108.

Ali MA, Shehata MM, Gomaa MR, Kandeil A, El-Shesheny R, Kayed AS, El-Taweel AN, Atea M, Hassan N, Bagato O, Moatasim Y, Mahmoud SH, Kutkat O, Maatouq AM, Osman A, McKenzie PP, Webby RJ, Kayali G. (2017) Systematic, active surveillance for Middle East Respiratory Syndrome Coronavirus in camels in Egypt. **Emerging Microbes & Infections** 6(1):e1.

Kandeil A, Shehata MM, El Shesheny R, Gomaa MR, Ali MA, Kayali G. (2016) Complete genome sequence of Middle East Respiratory Syndrome Coronavirus isolated from a dromedary camel in Egypt. **Genome Announcement** 4(2):e00309-16.

Kayali G, Peiris M. (2015) A more detailed picture of the epidemiology of Middle East Respiratory Syndrome Coronavirus. **The Lancet Infectious Diseases** 15(5):495-497.

Crameri G, Durr PA, Barr J, Yu M, Graham K, Williams OJ, Kayali G, Smith D, Peiris M, Mackenzie JS, Wang LF. (2015) Absence of MERS-CoV antibodies in feral camels in Australia: Implications for the pathogen's origin and spread. **One Health** 1:76-82.

Zhao J, Perera RA, Kayali G, Meyerholz D, Perlman S, Peiris M. (2015) Passive immunotherapy with dromedary immune serum in an experimental animal model for Middle East Respiratory Syndrome Coronavirus infection. **Journal of Virology** 89(11):6117-20.

Chan RW, Hemida MG, Kayali G, Chu DK, Poon LL, Alnaeem A, Ali MA, Tao KP, Ng HY, Chan MC, Guan Y, Nicholls JM, Peiris JS. (2014) Tropism and replication of Middle East Respiratory Syndrome Coronavirus from dromedary camels in the human respiratory tract: An in-vitro and ex-vivo study. **The Lancet Respiratory Medicine** 2(10):813-822.

Shehata MM, Gomaa MR, Ali MA, Kayali G. (2010) Middle East Respiratory Syndrome Coronavirus: A comprehensive review. **Frontiers of Medicine** 10(2):120-136.

Ehab A. Abu-Basha
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: abubasha@just.edu.jo

Professional Preparation

Jordan Uni. of Sci and Tech.	Veterinary Medicine	DVM	1994
Iowa State University	Vet. Pharmacology	MSc	1998
Iowa State University	Vet. Pharmacology/Toxic.	PhD	2002

Appointments

Country Coordinator, USAID EPT PREDICT-2	2016 - present
Vice President, Med. Network of Establishments for Vet. Education	2016 - present
Member, Council on Int'l Vet. Med. Edu./Assoc. of American Vet. Med. Col.	2016 - present
Dean, Faculty of Vet. Med., JUST	2013 - 2016
Vice Dean, Faculty of Vet. Med., JUST	2009 - 2013
Fulbright Fellow, Col. of Vet. Med., Iowa State University	2008 - 2009
Head, Dept. of Vet. Basic Sciences, Faculty of Vet. Med., JUST	2004 - 2008
Research and Teaching Assistant, Col. of Vet. Med., Iowa State University	1997 - 2002
Veterinarian, Animal Clinical Center, Faculty of Vet. Med., JUST	1994 - 1996

Publications

Ibrahim RA, Cryer TL, Lafi SQ, Abu-Basha EA, Good L, Tarazi YH. (2019) Identification of *Escherichia coli* from broiler chickens in Jordan, their antimicrobial resistance, gene characterization and the associated risk factors. **BMC Veterinary Research** 15(1):159.

Neves MI, Malkawi I, Walker M, Alaboudi A, Abu-Basha E, Blake DP, Guitian J, Crotta M. (2019) The transmission dynamics of *Campylobacter jejuni* among broilers in semi-commercial farms in Jordan. **Epidemiology & Infection** 147:e134.

van Doremalen N, *Hijazeen ZS*, Holloway P, Al *Omari B*, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, Abu-Basha E, Al-Majali AM, Munster VJ, Richt JA. (2019) High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Holloway P, Musallam I, Whiting M, Good L, Van Winden S, SilvaFletcher A, *Ababneh M*, Abu-Basha E, Guitian J. (2015) Building capacity to reduce biological threats in the Middle East. **Veterinary Record** 177(13):337-338.

Khalifeh MS, Abu-Basha EA. (2014) Boosting Newcastle disease vaccination efficacy under field conditions by aromatic plant essential oil extracts. **Veterinary Science Development** 4(2).

Abu-Basha EA, *Gharaibeh SM*, Thabet AM. (2015) In-vitro susceptibility of resistant *Escherichia coli* field isolates to antimicrobial combinations. **Journal of Applied Poultry Research** 21:595-602.

Catherine C. Machalaba
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001, USA
E-mail: machalaba@ecohealthalliance.org

Professional Preparation

Wake Forest University	Biology	BA	2008
Dartmouth Medical School	Public Health	MPH	2009
City University of New York	Environ. Health	PhD	2014 - present

Appointments

Research Scientist, EcoHealth Alliance	2018 - present
Policy Advisor, EcoHealth Alliance	2017 - present
Chair, Veterinary Public Health Group, American Public Health Association	2016 - present
Project Science Officer/IPO Lead, Future Earth oneHEALTH Project	2013 - present
Program Officer, IUCN SSC Wildlife Health Specialist Group	2010 - present
Program Coordinator for Health and Policy, EcoHealth Alliance	2010 - 2017
Fellow, Veterans Engineering Recourse Center, VA Boston Healthcare System	2009 - 2010
Field Agent and Educator, Vermont Department of Health	2005

Publications

Smith KM, Machalaba C, Seifman R, Feferholtz Y, *Karesh WB*. (2019) Infectious disease and economics: The case for considering multisectoral impacts. **One Health** 7:100080.

Berthe FCJ, Bouley T, *Karesh WB*, Le Gall FG, Machalaba CC, Plante CA, Seifman RM. (2018) Operational framework for strengthening human, animal and environmental public health systems at their interface. Washington, D.C.: **World Bank Group**.

Machalaba C, Salerno RH, Barton Behrevesh C, Benigno S, Berthe FCJ, Chungong S, Duale S, Echalar R, *Karesh WB*, Ormel HJ, Pelican K, Rahman M, Rasmuson M, Scribner S, Stratton J, Suryantoro L, Wannous C. (2018) Institutionalizing One Health: From assessment to action. **Health Security** 16(S1):S37-S43.

Schar D, Yamey G, Machalaba C, *Karesh WB*. (2018) A framework for stimulating economic investments to prevent emerging diseases. **Bulletin of the World Health Organization** 96(2):138-140.

Rostal MK, Ross N, Machalaba C, Cordel C, Paweska JT, *Karesh WB*. (2018) Benefits of a One Health approach: An example using Rift Valley fever. **One Health** 5:34-36.

Machalaba C, Smith K, Awada L, Berry K, Berthe F, Bouley TA, Bruce M, Cortiñas Abrahantes J, El Turabi A, Feferholtz Y, Flynn L, Fournié G, *Andre A*, Grace D, Jonas O, Kimani T, Le Gall F, Miranda JJ, Peyre M, Pinto J, Ross N, Ruegg S, Salerno RH, Seifman R, Zambrana-Torrelio C, *Karesh WB*. (2017) One Health economics to confront disease threats. **Transactions of the Royal Society of Tropical Medicine and Hygiene** 111(6):235-237.

Machalaba C, *Karesh WB*. (2017) Emerging infectious disease risk: Shared drivers with environmental change. **OIE Scientific and Technical Review** 36(2):435-444.

Baum SE, Machalaba C, Salerno RH, Daszak P, *Karesh WB*. (2016) Evaluating One Health: Are we demonstrating effectiveness? **One Health** 3:5-10.

Kelley TR, *Karesh WB*, Kreuder Johnson C, Gilardi KVK, Anthony SJ, Goldstein T, Olson SH, Machalaba C, PREDICT Consortium, Mazet JAK. (2017) One Health proof of concept: Bringing a transdisciplinary approach to surveillance for zoonotic viruses at the human-wild animal interface. **Preventive Veterinary Medicine** 137:112 118.

Wail Hayajneh
Food and Drug Administration (FDA), Amman, Jordan
E-mail: wialh@just.edu.jo

Professional Preparation

University of Jordan	Medicine	MBBS	1991
St. Joseph's Children Hospital	Residency - Pediatrics		1997
Children's Nat. Medical Center	Pediatric Infect. Dis. Flwsh		1998 – 2001

Appointments

Chairman, Infectious Diseases Committee, Jordan FDA	2018 - present
Dean, School of Medicine, JUST	2016 - 2018
Head, Infection Control Committee, King Abdullah University Hospital	2012 - present
Member, Institutional Board Review, King Abdullah University Hospital	2012 - 2016
Deputy Chief Executive Officer, King Abdullah University Hospital Mar	2012 - 2014
Chairman, Jordanian Pediatric Board Committee	2008 - 2012
Head, Jordanian Vaccine and Sera Licensing and Re-licensing Committee	2006 - 2007

Publications

Hajj A, Adaimé A, Hayajneh W, Abdallah A, Itani T, Hakimé N, Mallah M, Alsamarneh R, Badal R, Sarkis DK. (2018) Post Syrian war impact on susceptibility rates and trends in molecular characterization of *Enterobacteriaceae*. **Future Microbiology** 13(12):1419-1430.

Hayajneh WA, Daniels VJ, James CK, Kanibir MN, Pilsbury M, Marks M, Govcia MG, Elbasha EH, Dasbach E, Acosta CJ. (2018) Public health impact and cost effectiveness of routine childhood vaccination for hepatitis A in Jordan: A dynamic model approach. **BMC Infectious Diseases** 18(1):119.

Almomani BA, Hayajneh WA, Ayoub AM, *Ababneh MA*, Al Momani MA. (2018) Clinical patterns, epidemiology and risk factors of community-acquired urinary tract infection caused by extended-spectrum beta-lactamase producers: A prospective hospital case-control study. **Infection** 1-7.

Hayajneh W, Alhamad N, Shotar A, Almaaita S, Abuzeid H. (2018) Teicoplanin versus vancomycin in children of North Jordan: A comparative safety study. **Jordan Medical Journal** 52:15-25.

Hayajneh W, Al-Abdullat M, Al Shurman A, Maalouf J, Kutler B, Weiss T, Daniels C, Wolfson L. (2017) Estimating the health and economic impact of universal varicella 13 vaccination in Jordan. **Open Forum Infectious Diseases** 4(1):S309-S310.

Jaradat Z, Hamdan T, Hayajneh W, Al Mousa W, Shehabi A. (2017) Antimicrobial susceptibility, toxin profiling and molecular typing of *Staphylococcus aureus* isolates from two tertiary hospitals in Jordan. **The Journal of Infection in Developing Countries** 11:876-886.

Masaadeh H, Hayajneh W, Al Azzam I, Alkhatib A. (2016) Prevalence of streptococcus pneumoniae serotypes (Nasopharyngeal colonization) in children in North Jordan: Genotypic and phenotypic characteristics. **Research Journal of Biological Sciences** 11:23-33.

Mukattash TL, Hayajneh WA, Ibrahim SM, Ayoub A, Ayoub N, Jarab AS, Khdour M, Almaaytah A. (2016) Prevalence and nature of off-label antibiotic prescribing for children in a tertiary setting: A descriptive study from Jordan. **Pharmacy Practice (Granada)** 14(3).

Samrah S, Bashtawi Y, Hayajneh W, Almomani B, Momany S, Khader Y. (2016) Impact of colistin-initiation delay on mortality of ventilator-associated pneumonia caused by *A. baumannii*. **The Journal of Infection in Developing Countries** 10(10):1129-1134.

Zaidoun Saleh Hijazeen
Food and Agriculture Organization of the United Nations (FAO), Amman, Jordan
E-mail: zaidoun.hijazeen@fao.org

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	2003
Jordan Uni. of Sci. and Tech.	Vet. Int. Med. and Epi.	MS	2012

Appointments

National Consultant, FAO	2016 - present
Veterinarian, Ministry of Environment, UAE	2015 - 2016
Pathologist, Central Veterinary Laboratory-Ministry of Agriculture	2013 - 2015
Pathologist, Central Veterinary Laboratory-Ministry of Agriculture	2003 - 2010

Publications

van Doremalen N, Hijazeen ZSK, Holloway P, *Al-Omari B*, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2016) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Dawson P, Abu-Basha E, Amarneh B, Fahmawi A, Alshammari A, Alzaqa E , Hijazeen Z, *Talafha H, Al-Omari B, Al-Zghoul MB, Ababneh M, Ismail ZB, Karesh WB.* (2019) Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human disease risks among persons at camel farms, abattoirs, and meat markets in Jordan. **International Journal of Infectious Diseases** 79(1):63 64.

Abutarbush SM, Hijazeen ZSK, Doodeen R, Hawawsheh M, Ramadneh W, Al Hanatleh M. (2018) Analysis, description and mapping of camel value chain in Jordan. **Global Veterinarian** 20(3):144-152.

Zuhair Bani Ismail
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: zuhair72@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1995
Purdue University	Internship, Large Animal		1995 - 1998
Purdue University	Residency - Large Animal		1998 - 2001

Appointments

Professor, Dept. of Clinical Veterinary Medical Sciences, JUST	2013 - present
Department Head, Dept. of Clinical Veterinary Medical Sciences, JUST	2013 - 2016
Assist. Dean, Col. of Vet. Med. and Ani. Res., King Faisal University	2011 - 2013
Department Head, Clinical Veterinary Medical Sciences, JUST	2007 - 2009
Assistant Dean, Department of Clinical Veterinary Medical Sciences, JUST	2004 - 2007

Publications

Ismail ZB, Abutarbush SM, Al-Majali A, Gharaibeh MH, Al-Khateeb B. (2019) Seroprevalence and risk factors of *Leptospira* serovar Pomona and *Leptospira* serovar Hardjo infection in dairy cows in Jordan. **The Journal of Infection in Developing Countries** 13(6):473-479.

Ismail ZB, Muhaffel MM, *Abu-Basha E.* (2018) The effect of dry cow therapy using systemic tylosin in combination with common intramammary medications on mastitis rate, cull rate, somatic cell count, and milk production in dairy cows affected with subclinical mastitis. **Veterinary World** 11(9):1266-1271.

Ismail ZB. (2017) Mastitis vaccines in dairy cows: Recent developments and recommendations of application. **Veterinary World** 10(9):1057-1062.

Ismail ZB. (2017) Molecular characteristics, antibiogram and prevalence of multi-drug resistant *Staphylococcus aureus* (MDRSA) isolated from milk obtained from culled dairy cows and from cows with acute clinical mastitis. **Asian Pacific Journal of Tropical Biomedicine** 7(8).

Ismail ZB. (2017) Pneumonia in Dromedary camels (*Camelus dromedarius*): A review of clinico-pathological and etiological characteristics. **Journal of Camel Practice and Research** 24(1):49-54.

Whitney O. Bagge
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: bagge@ecohealthalliance.org

Professional Preparation

Uni. of California, San Diego	International Studies	BA	2008
Yale University	Public Health	MPH	2011
Stanford University	Envir. and Resources	PhD	2017

Appointments

Disease Ecologist, EcoHealth Alliance	2018 - present
Volunteer, World Health Organization	2018 - 2018
Editor, Edanz Group Japan KK	2017 - 2018
English Teacher, Sakkara Language School, Cairo, Egypt	2008 - 2009

Publications

Anderson N, Bagge W, Webber C, Zarras P, Davis MC. (2008) Procedure for the rapid synthesis of the monomer 1,4-Bis(chloromethyl)-2-(2-ethylhexyloxy)-5-methoxybenzene. **Synthetic Communications** 38(22):3903-3908.

Bilal Abduh Al Omari
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail:

Professional Preparation

Jordan Uni. of Sci. and Tech.	Medical Technology	BSc	1990

Appointments

Supervisor of the Diagnostic Laboratory, Veterinary Health Center, JUST	2002 - present
Faculty, Department of Clinical Veterinary Medical Sciences, JUST	2002 - present
Teaching Assistant, Dept of Clinical Veterinary Medical Sciences, JUST	1993 - 2002
Research Assistant, Biotechnology Laboratory, JUST	1992 - 1993

Publications

van Doremalen N, *Hijazeen ZS*, Holloway P, Al Omari B, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2017) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Al-Essa MK, Abu Baker N, Alzoubi K, *Al-Zhgoul MB*, Khlouf S, Al-Saleh AR, Al-Omari B, Abu-Tayeh R, Shomaf M, Battah A, Al-Hadidi K, *Ismail ZB*. (2012) Evaluation of the subacute toxic effects of an isotonic D-ribose solution administered intravenously to Fischer Rats. **Jordan Journal of Pharmaceutical Sciences** 5(2).

Ismail ZB, Abu-Baker N, Alzoubi K, *Al-Zhgoul MB*, Al-Essa MK, Khlouf S, Al-Saleh A, Al-Omari B, Abu-Tayeh R, Shomaf M, Battah A, Al-Hadidi K. (2012) Evaluation of *D-ribofuranose* (D-ribose) toxicity after intravenous administration to rabbits. **Human & Experimental Toxicology** 31(8):820-9.

Ismail ZAB, Al-Majali A, *Ababneh H*, Al-Omari B. (2007) Laryngeal Leeches causing exercise intolerance, respiratory distress and hemoptysis in a hunting dog. **Internet Journal of Internal Medicine** 3(1).

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Zuhair Bani Ismail	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global, Jordan

Person-Months Per Year Committed to the Cal:12 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: 36 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Bilal Al Omari

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA
Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024
Location of Project: Jordan
Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: 1,200,000 Total Award Period Covered: 10/01/2014-09/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 4.8 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Moh'D Borhan Al-Zghoul

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Mustafa Ababneh	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 4.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria. TCP/JOR/3502. Project Leader.

Source of Support: FAO/USAID

Total Award Amount: 95,000 USD. Total Award Period Covered: 2015-2017

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan. OSRO/GLU/505/USA. Project Leader.

Source of Support: FAO/USAID

Total Award Amount: 45,000 USD. Total Award Period Covered: 2016-2017

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Emily Hagan	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Liberia

Person-Months Per Year Committed to the Cal: 4.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 12 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH

Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020 - 02/28/2025

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Patrick Dawson

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ghazi Kayali	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,465,477.43 Total Award Period Covered: 06/23/2016-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Ecology of Avian Influenza and MERSCoV in the Middle East and Africa

Source of Support: NIH

Total Award Amount: $5,361,497.58 Total Award Period Covered: 09/22/2014-03/31/2021

Location of Project: Global

Person-Months Per Year Committed to the Cal: 10.8 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Supporting the Zoonotic Disease Committee in Egypt

Source of Support: DOS BEP

Total Award Amount: $76,697.80 Total Award Period Covered: 10/1/2019 – 09/30/2020

Location of Project: Egypt

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ehab Abu-Basha	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 12.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 8.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Educational Twining program between Royal Veterinary College and Jordan University of Science and Technology

Source of Support: OIE

Total Award Amount: $726,720.67 Total Award Period Covered: 01/01/2014 – 12/31/2019

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 3.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Catherine C. Machalaba	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 6.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, South Africa

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Health Alert Forecasting through Climate, Land use & Infectious Disease Monitoring

Source of Support: Belmont Forum/NOAA

Total Award Amount: $1,300,000.00 Total Award Period Covered: 01/01/2020 - 12/31/2022

Location of Project: USA

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

READY

Source of Support: USAID

Total Award Amount: $143,605.00 Total Award Period Covered: 09/25/2018 - 09/30/2021

Location of Project: USA

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator:

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
One Health Workforce

Source of Support: USAID
Total Award Amount: $5,040,700 Total Award Period Covered: 10/19/2019 - 10/18/2024
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.1 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Whitney O. Bagge

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 2.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA

Total Award Amount: $4,988,526 Total Award Period Covered: 08/15/2019 - 08/14/2024

Location of Project: USA, South Africa

Person-Months Per Year Committed to the Cal:12 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

NSF Form 1239 (10/99) USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Wail Hayajneh	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Antimicrobial Testing Leadership and Surveillance (ATLAS)

Source of Support: Pfizer

Total Award Amount: $25,000 Total Award Period Covered: 02/01/2018 – 01/31/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Zaidoun Saleh Hijazeen	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan

Source of Support: USAID

Total Award Amount: $955,000.00 Total Award Period Covered: 01/04/2016 - 12/31/2020

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 9.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Hani Ahmad Talafha

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA
Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024
Location of Project: USA, Jordan
Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014 - 9/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 4.8 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

NSF Form 1239 (10/99) USE ADDITIONAL SHEETS AS NECESSARY

References

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3. FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance, New York, United States
EcoHealth Alliance is an US-based NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EcoHealth Alliance scientists have been conducting field research on infectious zoonotic diseases for over three decades. EcoHealth Alliance is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory – freezer storage and light microscopy. The scientific staff (15 core scientists, 100+ field staff) is supported by a core admin staff of 11, which is available for work on this project and is also funded through private individual and foundation support.

EcoHealth Alliance is equipped with 25 networked computers (PCs and Macs) including ARRA funded International LifeSize Video Conferencing facilities, and high-speed video conferencing facilities have been installed with key international collaborators. EcoHealth Alliance has access to a 24-7 server, server support, and all required software including ArcGIS, MatLab, SPSS, Microsoft Office, and Adobe CS3 running on both Apple and Windows Operating Systems. Additionally, we have a four-processor, public IP addressed Linux server which can be used for intensive computational modeling and database processing by all the grantees.

EcoHealth Alliance is the headquarters of two networks that provide exceptional leverage for the core scientists: 1) The EcoHealth Alliance Local Conservation Partners: A global partnership of 15 NGOs in Asia (including Bangladesh, India, and China), Africa and Latin America (including Argentina and Brazil). This network provides access to fieldwork in countries (such as India) that are often difficult to work in, and obtain samples from; 2) The Consortium for Conservation Medicine: A unique collaborative institution linking Johns Hopkins Bloomberg School of Public Health, Tufts University School of Veterinary Medicine Center for Conservation Medicine, The University of Pittsburgh Graduate School of Public Health, The University of Wisconsin-Madison Nelson Institute for Environmental Studies, The USGS National Wildlife Health Center, and EcoHealth Alliance. The CCM provides access to hundreds of high caliber scientists, their facilities, and their students at 6 leading institutes of public health, veterinary medicine, and environmental science in the USA.

Jordan University of Science and Technology, Irbid, Jordan
The Faculty of Veterinary Medicine at JUST is the only veterinary school in Jordan. It was established in1998 by Royal Decree. The Faculty consists of 3 different departments; Clinical sciences, basic sciences, and pathology and public health. There are several teaching and research laboratories in the Faculty. The Faculty is the home of several PhD holders and board-certified clinicians. The Basic Science Department is the home of a state-of-the-art Molecular Biology and Virology Laboratory which is the only laboratory of its kind in Jordan. The laboratory is well equipped and implements many molecular and diagnostic assays by a group of well-trained national scientists, young graduate students and technicians according to the latest scientific standards. Highly advanced molecular diagnostic assays such as cloning into TOPO vector, preparing PCR products for sequencing, and sequence analysis are performed routinely in this laboratory. In Jordan, the JUST Molecular Biology and Virology Laboratory is now considered an important hub for training and preparing future scientists with many graduate

students now being trained in the lab to perform techniques from sample handling to DNA extraction, cDNA synthesis, performing PCR protocols, cloning, plasmid purification, and genetic sequencing analysis.

The Faculty is also the home of the Veterinary Health Center (VHC). It is the only veterinary teaching clinic in Jordan. At the VHC, the veterinary Diagnostic Laboratory is equipped with various state of the art tools that enable it to perform all needed diagnostic and research tests. The laboratory is equipped with hematology, clinical chemistry analyzers, PCR machines, ELISA readers. The laboratory is also able to perform basic bacteriology tests such as bacterial culture, identification and sensitivity tests.

JUST is also host to the Princess Haya Biotechnology Center, a state-of-the-art center promoting research, diagnostics and training in Molecular Genomics and Biorisk Management. The Center provides faculty members, graduate and undergraduate students, and regional organizations with a robust and excellent scientific infrastructure to support important experimental research in biotechnology, particularly in the fields of genomics, metabolomics and proteomics. The center comprises a total of sixteen research laboratories and occupies approximately 1,500 square meters.

ATTACHMENT 3 SUPPORTING DOCUMENTATION

1. FOREIGN PRINCIPLE INVESTIGATORS AND OTHER MEMBERS OF FOREIGN RESEARCH TEAM

Foreign PI:
None

Foreign Co-I:
Ehab A. Abu-Basha, PhD, MSc, DVM
Vice President, Medical Network of Establishments for Veterinary Education, Jordan

Ghazi Kayali, PhD, MPH, BS
Chief Executive Officer, Human Link, Lebanon

Other members (alphabetical order):
Mustafa Ababneh, PhD, BS
Faculty, Department of Basic Medical Sciences, Jordan University of Science and Technology, Jordan

Bilal Abduh Al Omari, BSc
Supervisor of the Diagnostic Laboratory, Veterinary Health Center, Jordan University of Science and Technology

Moh'd Borhan Al-Zghoul, PhD, MS, BS
Vice Dean, Department of Basic Medical Veterinary Sciences, Jordan University of Science and Technology, Jordan

Wail Hayajneh, MBBS
Chairman, Infectious Diseases Committee, Jordan Food and Drug Administration, Jordan

Zaidoun Saleh Hijazeen, MS, BS
National Consultant, Food and Agriculture Organization of the United Nations, Jordan

Zuhair Bani Ismail, BS
Professor, Dept. of Clinical Veterinary Medical Sciences, Jordan University of Science and Technology, Jordan

Saied Jaradat, PhD
Director, Princess Haya Biotechnology Center, Jordan University of Science and Technology, Jordan

Hani A. M. Talafha, MS, BS

Director of Research Services and Lecturer, Jordan University of Science and Technology, Jordan

2. DESCRIPTION OF RELATIONSHIP BETWEEN PROJECT AND CURRENT RESEARCH EFFORTS OF FOREIGN RESEARCH TEAM

Foreign Co-Investigator Dr. Ehab Abu-Basha is a professor at the Jordan University of Science and Technology (JUST) and former Dean of the School of Veterinary Medicine. He and the additional collaborators from JUST were the first to identify MERS-CoV in camels in Jordan during work with the USAID Emerging Pandemic Threats (EPT) program in coordination with PI Karesh and EcoHealth Alliance (EHA). Co-I Abu-Basha served as the Country Coordinator over the previous 3 years for the EHA/JUST implemented USAID EPT PREDICT project lead by PI Karesh and managed by Co-I Dawson from EHA and now at US CDC but participating in this proposed project. The staff included in this proposal at the three JUST laboratories identified for this project (Diagnostic Laboratory-Faculty of Veterinary Medicine, the Molecular Biology and Virology lab - Faculty of Veterinary Medicine and the Princess Haya Biotechnology Center) performed PCR and serology diagnostics for influenza and coronaviruses for the USAID EPT PREDICT-2 project. JUST field teams included in this proposal performed the human and animal sampling for the USAID EPT PREDICT project and conducted the behavioral interviews required for the project. Dr. Wail Hayajneh, MBBS, is Chairman of the Jordanian Food and Drug Administration and a professor at the JUST Medical University. He served as an advisor on the USAID EPT PREDICT-2 project for the human studies components and will continue in this role for the proposed project.

Foreign Co-Investigator Dr. Ghazi Kayali, CEO of Human Link, oversees two virology laboratories, one in Egypt to be used in this project and one in Lebanon. He has exclusive use of 2160 sq. ft. of contiguous laboratory and office space in the newly completed Advanced Science building at the National Research Centre in Egypt. The Human Link team includes 1 lab director, 1 postdoc, 1 research assistant, 9 graduate students, 7 field veterinarians, 4 zoologists, 4 field clinicians, and 19 field nurses working on various surveillance, cohort, and laboratory studies. Dr. Kayali is a world-renowned subject matter expert for influenza and coronaviruses. He is part of the NIAID CEIRS network and the DTRA/GCRF CANARIES network and served as USAID PREDICT-2 project leader for Egypt over the previous 3 years for the EHA/Human Link implemented USAID EPT PREDICT project lead by PI Karesh and managed by Co-I Dawson from EHA and now at US CDC but participating in this proposed project.

Dr. Mahmoud Alhanatleh is the Chief Veterinary Officer for the Jordanian Ministry of Agriculture. He served as an advisor on the USAID EPT PREDICT-2 project for the animal studies components, hosted partner and stakeholder meetings, and oversaw the project interface with government animal health care workers in all regions of Jordan. He

will continue in this role for the proposed project and serve as a liaison with the Jordanian government (see letter of support).

Dr. Wail Hayajneh is the Chairman of the Infectious Diseases Committee of the Jordanian Food and Drug Administration. He was formerly the Dean of the School of Medicine at Jordan University of Science and Technology. He is a subject matter expert on zoonotic diseases and served as an advisor on the USAID EPT PREDICT-2 project in humans. He will continue as a project advisor for the proposed project and serve as a liaison with the Jordanian government.

3. FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance, New York, United States
EcoHealth Alliance is an US-based NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EcoHealth Alliance scientists have been conducting field research on infectious zoonotic diseases for over three decades. EcoHealth Alliance is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory – freezer storage and light microscopy. The scientific staff (15 core scientists, 100+ field staff) is supported by a core admin staff of 11, which is available for work on this project and is also funded through private individual and foundation support.

EcoHealth Alliance is equipped with 25 networked computers (PCs and Macs) including ARRA funded International LifeSize Video Conferencing facilities, and high-speed video conferencing facilities have been installed with key international collaborators. EcoHealth Alliance has access to a 24-7 server, server support, and all required software including ArcGIS, MatLab, SPSS, Microsoft Office, and Adobe CS3 running on both Apple and Windows Operating Systems. Additionally, we have a four-processor, public IP addressed Linux server which can be used for intensive computational modeling and database processing by all the grantees.

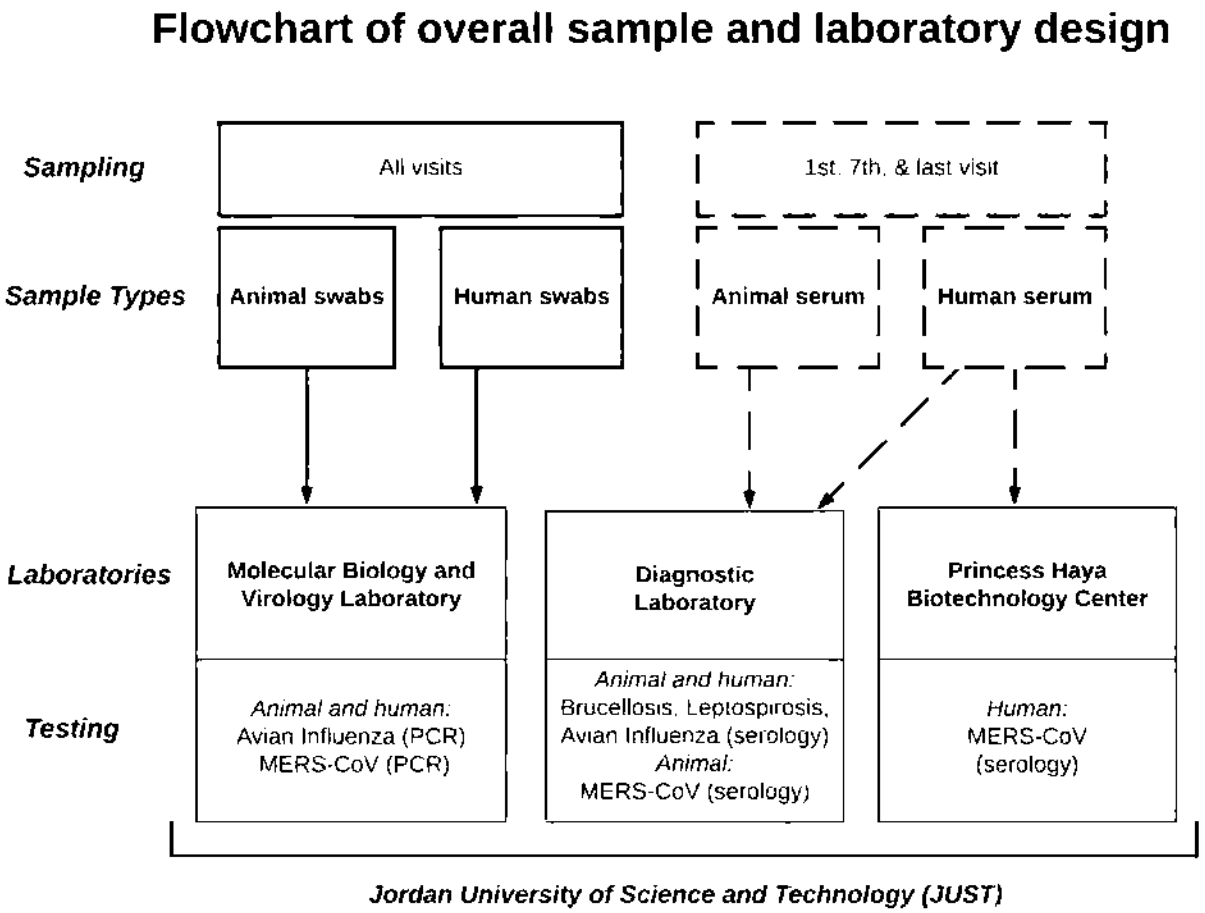
EcoHealth Alliance is the headquarters of two networks that provide exceptional leverage for the core scientists: 1) The EcoHealth Alliance Local Conservation Partners: A global partnership of 15 NGOs in Asia (including Bangladesh, India, and China), Africa and Latin America (including Argentina and Brazil). This network provides access to fieldwork in countries (such as India) that are often difficult to work in, and obtain samples from; 2) The Consortium for Conservation Medicine: A unique collaborative institution linking Johns Hopkins Bloomberg School of Public Health, Tufts University School of Veterinary Medicine Center for Conservation Medicine, The University of Pittsburgh Graduate School of Public Health, The University of Wisconsin-Madison Nelson Institute for Environmental Studies, The USGS National Wildlife Health Center, and EcoHealth Alliance. The CCM provides access to hundreds of high caliber scientists, their facilities,

and their students at 6 leading institutes of public health, veterinary medicine, and environmental science in the USA.

Jordan University of Science and Technology, Irbid, Jordan

The Faculty of Veterinary Medicine at JUST is the only veterinary school in Jordan. It was established in1998 by Royal Decree. The Faculty consists of 3 different departments; Clinical sciences, basic sciences, and pathology and public health. There are several teaching and research laboratories in the Faculty. The Faculty is the home of several PhD holders and board-certified clinicians. The Basic Science Department is the home of a state-of-the-art Molecular Biology and Virology Laboratory which is the only laboratory of its kind in Jordan. The laboratory is well equipped and implements many molecular and diagnostic assays by a group of well-trained national scientists, young graduate students and technicians according to the latest scientific standards. Highly advanced molecular diagnostic assays such as cloning into TOPO vector, preparing PCR products for sequencing, and sequence analysis are performed routinely in this laboratory. In Jordan, the JUST Molecular Biology and Virology Laboratory is now considered an important hub for training and preparing future scientists with many graduate students now being trained in the lab to perform techniques from sample handling to DNA extraction, cDNA synthesis, performing PCR protocols, cloning, plasmid purification, and genetic sequencing analysis.

The Faculty is also the home of the Veterinary Health Center (VHC). It is the only veterinary teaching clinic in Jordan. At the VHC, the veterinary Diagnostic Laboratory is equipped with various state of the art tools that enable it to perform all needed diagnostic and research tests. The laboratory is equipped with hematology, clinical chemistry analyzers, PCR machines, ELISA readers. The laboratory is also able to perform basic bacteriology tests such as bacterial culture, identification and sensitivity tests. JUST is also host to the Princess Haya Biotechnology Center, a state-of-the-art center promoting research, diagnostics and training in Molecular Genomics and Biorisk Management. The Center provides faculty members, graduate and undergraduate students, and regional organizations with a robust and excellent scientific infrastructure to support important experimental research in biotechnology, particularly in the fields of genomics, metabolomics and proteomics. The center comprises a total of sixteen research laboratories and occupies approximately 1,500 square meters.



Human Link, Hazmich, Lebanon

Human Link is a Lebanese-based non-governmental organization, founded in 2014 by a multidisciplinary team of scientists and experts in the fields of human development, engineering, and public health, with a common goal of "research advancing knowledge." Human Link's mission is to design and conduct scientific research and projects in the fields of bio-medicine, public health, environment, economy, and human development aimed at improving global knowledge and enhancing local population livelihoods. Human Link adopts the One-Health philosophy that links human, animal, and environmental health. At the heart of this philosophy is the notion that a healthy environment leads to healthier humans and healthier animals. It aims at reducing the burden of diseases affecting humans through unhealthy animals and unhealthy environment. At the same time, it aims at reducing the burden on the environment exerted by humans and animals.

Dr. Ghazi Kayali, CEO of Human Link, oversees two virology laboratories, one in Egypt and one in Lebanon. Human Link has exclusive use of 2160 sq. ft. of contiguous laboratory and office space in the newly completed Advanced Science building at the National Research Centre in Egypt and 2000 sq. ft. in contiguous laboratory and office space in Lebanon. A 120 sq. ft. office adjoins the laboratory, used exclusively by Dr. Kayali, and a 120 Sq. ft. office for a Secretarial Assistant.

The team includes 1 lab director, 1 postdoc, 1 research assistant, 9 graduate students, 7 field veterinarians, 4 zoologists, 4 field clinicians, and 19 field nurses working on various surveillance, cohort, and laboratory studies. All personnel have institutional laptops connected to shared cloud-based work space. PCR stations, gel documentation systems, and a DNA quantification machine, etc. are operated by connected laptops.

The laboratory in Egypt includes a dedicated tissue culture facility with 2 laminar flow hoods. The main laboratory contains benches for 12 workers, 1 fume hood, 1 fluorescence microscope, 1 inverted light microscope, 3 sinks, a de-ionized water system, a class 3 glove box, a laminar flow hood, 3 -80 freezers, 6 -20 freezers, 5 refrigerators, 5 thermal cyclers, 2 real-time PCR machines, 1 nano-drop, 2 gel documentation systems, and all necessary small laboratory equipment. The laboratory also has access to shared Ion torrent and Illumina MiSeq sequencers.

The laboratory in Lebanon includes a dedicated tissue culture facility, dedicated dark room, and dedicated PCR preparation room. The main laboratory contains benches for 24 workers and trainees, 1 fume hood, 3 sinks, 1 -80 freezer, 1 -20 freezer, 1 refrigerator, 1 thermal cycler, 1 real-time PCR machine, 1 gel documentation system, and all necessary small laboratory equipment.

Dr. Kayali is part of the NIAID CEIRS network, USAID PREDICT network, and DTRA/GCRF CANARIES network. This enhances the work environment and provides access to additional expertise in virology, epidemiology, modeling, and genomics. Dr. Kayali also holds an adjunct assistant professor position at the department of Epidemiology, Genetics, and Environmental Sciences at the University of Texas School of Public Health.

4. FOREIGN PI AND KEY PERSONNEL LETTERS OF COLLABORATION

See next page.

Centers for Disease Control and Prevention

National Center for Emerging and Zoonotic Infectious Diseases
1600 Clifton Rd., MS E-93
Atlanta GA 30329

August 22nd, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Patrick Dawson

This letter signifies my commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity.*

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience has been with working in Jordan and Egypt over the last seven years on research relating to MERS-CoV and Avian Influenza in animals and humans. Through this work I have partnered with the Jordan University of Science and Technology in Jordan and Human Link in Lebanon. Over the past four years we've developed a positive working relationship through EcoHealth Alliance that I hope to see continue. In my new role, I'll be able to stay to on in an advisory capacity at the start of the project, and assist with data analysis in Year 3.

Sincerely,

Patrick D. Dawson

Patrick Dawson, PhD, MPH
Epidemic Intelligence Service Officer
Division of High-Consequence Pathogens and Pathology
National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention (CDC)

المملكة الأردنية الهاشمية

وزارة الزراعة

الرقم .....

التاريخ .....

الموافق .....

August18th, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Dr. Mahmoud Alhanatleh, CVO, MOA- JORDAN

This letter signifies the Ministry of Agriculture commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity.*

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

Our previous experience with one health initiatives is directly relevant to the project objectives. The projects "Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan", "Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria" and "PREDICT-2 Jordan" has successfully achieved there's research objectives, including developing capacity within Jordan for research, training, surveillance and control. This new collaboration will serve to further build capacity in these areas, equipping Jordan to grow as a regional hub for interdisciplinary, one health approaches to the challenges posed by emerging infectious diseases such as MERS-CoV and Avian Influenza.

We whole heartedly endorse this proposal and the added capacity it will bring to the Ministry of Agriculture in Jordan forMERS-CoV and AI research, training, surveillance, and control.

Sincerely,

Director Of
Veterinary & Animal Health
Dr. Mahmoud Al Hanatleh

Dr. Mahmoud Alhanatleh
Director of Veterinary Directorate (CVO)
OIE Delegate
MOA- JORDAN

Human

August 14, 2019

To: DTRA C-WMD Thrust Area 6 Program

From: Ghazi Kayali PhD MPH

This letter signifies my commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity*.

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience with studying Avian Influenza and MERS CoV at the human-animal interface is directly relevant to the project objectives. I have been conducting surveillance for influenza and MERS in poultry, wild birds, swine, camels, bats, humans, cattle, and ruminants in several countries in the Middle East and Africa since 2013. Furthermore, in my capacity as a WHO EMRO consultant, I am familiar with the needs of Jordan and believe that this project will enhance the country's One Health and disease surveillance capacities.

Sincerely,

Ghazi Kayali PhD MPH

CEO, Human Link

Hazmieh, Lebanon

Office Address
Hazmieh, Said Freiha Str.
Camelia II Center, 3rd Floor
Baabda, Lebanon.

Office Lines
Tel: +961 5 45 42 52
Fax: +961 5 45 80 45

Email / Web
www.human-link.org
info@human-link.org

Jordan University of Science & Technology

جامعة العلوم والتكنولوجيا الأردنية

ص.ب ٣٠٣٠ اربد ٢٢١١٠ الأردن هاتف ٧٢٠١٠٠٠ ٢٠٩٦٢ فاكس ٧٠٩٥١٢٣ ٢٠٩٦٢

Ref: الرقم:

Date: التاريخ:

الموافق:

August 18th, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Professor Ghassan Tashtoush, Dean of research, JUST

This letter signifies the Deanship of Research at Jordan University of Science and Technology (JUST) commitment to support the proposal "*Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity*".

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

JUST is a leading center of excellence in MERS-CoV research in Jordan and the wider region, with a strong regional influence and a proven track record in delivering high quality scientific research of a global standard. Prof. Ehab Abu-Basha has become a regional expert in MERS-CoV research, policy and control. Over the past two years he has been coordinating monthly Focal Point Meetings among all relevant emerging infectious diseases stakeholders in Jordan (governmental, WHO, FAO and others) to promote synergy of effort, prevent unnecessary duplication of resources or activities and to advise on policy. Prof. Wail Hayajneh, is Professor of Infectious Diseases at Medical school and he is also coordinating the Infectious Diseases group of Jordan and as such is at the forefront of MERS-CoV diagnosis, treatment, surveillance and control in Jordan. In addition to a highly qualified team of experts in the field of Virology, Avian diseases, Livestock infectious diseases that will add great value to the outcomes of this project.

This project will also build upon the considerable research and training capacity already developed at JUST. We whole heartedly endorse this proposal and the research value that it will add to Jordan and to the region.

Sincerely,

Ghassan Tashtoush, Professor and Dean of research

JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY
OFFICE OF THE DEAN OF RESEARCH
Irbid - Jordan

P.O. Box (3030) Irbid 22110 Jordan. Tel (962-2) 7201000 - Fax (962-2) 7095123

website: http://www.just.edu.jo

5. PLANNED WORKSHOPS: TOPIC, IMPLEMENTER, AND TIMELINE

All trainings to be conducted in Amman or Irbid, Jordan except where noted.

Description	Participants	Timeline
Project Inception Workshop *One-day review of entire research design and anticipated outputs during kick-off meeting* • Overall research study protocol • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. FDA Min of Environ. Poultry Industry Camel "industry"	Y1 Q1
Jordan Training Workshop 1 *Three-day didactic workshop targeted to all personnel engaged with human subjects and animals at field study sites, laboratory staff and others who will handle human and animal data* • Basic Laboratory Safety Biosafety and Biosecurity • Cold Chain Implementation • Ethical Human Subjects Research • Ethical Animal Subjects Research • Safe Human Sampling • Safe Animal Sampling • Questionnaire Administration • Data Management and Storage	*Required attendance:* Project Personnel *Invited attendees:* Min. of Health Min. of Agric. FDA Min of Environ. Poultry Industry Camel "industry" Students	Y1 Q2
Training at Human Link lab at the National Research Centre, Egypt *Three-day hands on training in MERS-CoV diagnostics and advanced avian influenza diagnostics with Co-I Kayali to prepare for human sample MERS-CoV testing in Jordan (no samples will be transported outside of Jordan).*	Three Jordanian project personnel and three Jordanian students	Y1 Q4
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Review of research study design • Presentation of Results from Year 1 • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y2 Q1
Regional Training Workshop 1 *Three-day didactic workshop in adherence to core principles and requirements for safe and secure sample handling and management (based on written DTRA requirements and BMBL 5th Edition Sections III-VI and current best practice standards)* • Review of research study design • Presentation of Results from Year 1	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric.	Y2 Q3

• Basic Laboratory Safety Biosafety and Biosecurity • Cold Chain Implementation • Ethical Human Subjects Research • Ethical Animal Subjects Research • Safe Human Sampling • Safe Animal Sampling • Questionnaire Administration • Data Management and Storage • Disease Reporting Procedures for OIE and WHO IHR	Jordan FDA Min of Environ. Poultry Industry Camel "industry"	
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Review of research to date • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y3 Q1
Training at Princess Haya Biotechnology Centre, JUST *Hands on training and quality assurance checks and data interpretation training and collaboration on MERS-CoV diagnostics with Co-I Kayali.*	Jordanian project personnel and students	Y3 Q1
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Presentation of Results from Years 1-3 • Policy recommendations • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y3 Q4 *Or* OY1 Q1 If option is exercised
Regional Training Workshop 2 **Laboratory techniques, Biosafety and Biosecurity** *Three-day didactic and hands-on intensive training and refresher training on Biosafety and Biosecurity* • Real-time PCR testing and analysis • Influenza Subtyping, Genomic Analysis of MERS-CoVs • Serology testing and analysis • Biosafety and Biosecurity Refresher Training	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY1 Q3
Training at Princess Haya Biotechnology Centre, JUST *Hands on quality assurance checks and data interpretation training and collaboration on MERS-CoV diagnostics with Co-I Kayali.*	Jordanian project personnel and students	OY1 Q4
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities*	Project Personnel Min. of Health	OY2 Q1

• Review of research to date • Discussion and input from partners and stakeholders	Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	
Regional Training Workshop 2 **Analyses and Surveillance, Biosafety and Biosecurity** *Three-day didactic and hands-on intensive training and refresher training on Biosafety and Biosecurity* • Geospatial Analysis • Advanced Epidemiology • One Health Disease Surveillance • Biosafety and Biosecurity Refresher Training	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY2 Q3
Threat Reduction Workshop *This three-day focused, Jordan country-level workshop will be developed and facilitated by the project team in consultation with partners and frameworks pertinent to zoonotic disease risk and impact mitigation (e.g. through World Bank, FAO, OIE, WHO, GHSA, UNDRR) to promote broader alignment and uptake.* • Targeting risk factors in production systems • Disease prevention and control strategies • Economic analysis • Multi-sectoral action plans and roadmaps	*Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. and representatives from other key sectors (e.g. disaster management, finance, industry)	OY2 Q3
Final Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Presentation of all project results • Policy recommendations • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY2 Q4

6. GUIDELINES AND PROTCOLS FOR HUMAN AND ANIMAL SUBJECTS RESEARCH

For human subjects research, our protocols will align with PREDICT protocols with which our in-country teams have been complying for three years. They will be modified to reference the specifics of this project's IRB (as opposed to PREDICT's IRB).

- 5.4 Human Syndromic Surveillance (see next page)

USAID | PREDICT

Section 5.4. Human Syndromic Surveillance

Prepared by
Christine K Johnson, PREDICT Biological and Ecological Surveillance Lead, UC Davis
Karen Saylors, PREDICT Behavioral Surveillance Co-Lead, Metabiota
Corina Monagin, Metabiota

With contributions from:
Maureen Miller PREDICT Behavioral Surveillance Lead
Jason Euren, Metabiota
Ashley Lucas, Metabiota
Nicole Ureda, UC Davis
Kim Dodd, Metabiota
Brian Bird, UC Davis
David Wolking, PREDICT Operations Officer
Tracey Goldstein, PREDICT Pathogen Discovery Lead
and the PREDICT One Health Consortium

Objectives: To safely and ethically collect biological samples and data from humans in clinical settings.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

The authors assert that human surveillance and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Human Syndromic Surveillance

Table of Contents: Human Syndromic Surveillance

Planning Syndromic Surveillance

Procedures for Patients in Hospitals and Clinics

References and Appendices

Section 5.4.1. Confirmation of Knowledge

When you are familiar with the information in this guide, take the PREDICT quiz ***Section 8.4.12. Human Syndromic Surveillance***.

PREDICT team members involved in the human surveillance activities described in this guide must be familiar with PREDICT's Institutional Review Board (IRB)-approved Master Protocol and related IRB obligations and should take and pass the quiz ***Section 8.4.18. PREDICT IRB Compliance and Monitoring***.

Section 5.4.2. Ethical and Training Considerations

All PREDICT activities involving human subjects must adhere to the most up-to-date version of the Master Protocol that has been approved by the UC Davis Institutional Review Board (IRB). The Master Protocol is available online through the PREDICT Operating Procedures e-Book under "Section 5.3" (https://eidith.org/Resources/PREDICTOperatingProcedureseBook.aspx). In addition, PREDICT activities involving human subjects may only be initiated after obtaining ethical approval from country institutional review boards.

Before implementing human subjects research related activities, documentation of all necessary country approvals along with attestations of trainings and adherence to ethical standards must be provided for review to UCD, and the UCD IRB as appropriate. These include

1) documentation of local IRB/ethical approvals and all approved documents (including the consent form and human questionnaire translated into the local language and any additional introduction letters and recruitment scripts planned for use);
2) completion of CITI training for all personnel listed on the country protocol (with training events documented in EIDITH);
3) training of project staff in procedures outlined in this SOP (with training events documented in EIDITH);
4) identification and documentation of local institutional biosafety committee (IBC) requirements (if any);
5) a consultation from a local expert summarizing risks to the area; and
6) an attestation that all personnel will adhere to USA and local government federal and state regulations regarding protection of human subjects research.

A checklist with both country IRB preparation guidance and post country IRB approval procedures relating to UC Davis IRB authorization has been created to assist country teams with this process (Appendix 1). Please review this checklist when preparing your application for

country IRB submission and to guide the final UCD IRB authorization process following local IRB approval. **The UC Davis IRB must approve each country's protocol before local activities are initiated.**

Effort will be made in all recruitment, consent, sampling, and interview activities to assure potential participants that their **participation in the study is completely voluntary** and that all information shared with researchers will be kept confidential. Every effort will be made to avoid coercion and ensure the privacy, respect, dignity, and freedom of each participant.

PREDICT staff named on the country protocol must complete Collaborative Institutional Training Initiative (CITI) training in human research ethics for biomedical researchers. In addition, PREDICT staff listed in the country protocol will need to ensure proper training of hospital/clinic POC(s) in study procedures, including recruitment, enrollment, informed consent, and sample collection, to ensure compliance with our Master IRB protocol and PREDICT practices.

When the staffing and implementation plans have been established, a plan should be developed to train clinic and hospital staff on protocol procedures to ensure implementation of agreed upon study design. Consideration should be given to how information will be presented, as not every facility staff member will need to know every detail of the PREDICT plan.

Section 5.4.3. Partnerships with Participating Health Facilities

Symptomatic patients will be recruited for syndromic surveillance in collaborating health facilities that have a catchment area that includes high-risk communities and PREDICT field sites where linked animal and human samples are being collected concurrently.

Syndromic surveillance of patients presenting to health facilities is necessary to identify symptomatic individuals. In order to optimize the chances of accessing the most relevant acute symptomatic individuals presenting at health facilities, appropriate selection and engagement of health facilities is key. While each individual site will require a slightly different approach, teams can be guided by the following methodology when looking to engage and maintain relationships with their sites in each country.

Assessment of the Health Facility

After initial engagement with key personnel, teams will need to work collaboratively with health facility personnel to consider the most optimal way to engage with clinical, laboratory and professional staff. A short form to assist with initial assessment of potential partners for syndromic surveillance is attached in Appendix 2 (Health Facility Screening Form).

Understanding Patient Flow

A thorough review of patient flow from arrival at the facility to discharge should be done by country teams through scoping site visits including:

- Where do patients normally present upon arrival to the facility and who would they first come into contact with for initial screening and assessment?
- What health professionals would potentially be involved in the assessment, diagnosis and treatment of individuals presenting with syndromes of interest throughout their stay at the health facility?
- If patients are not admitted to a health facility but might require follow-up care, what are the normal follow-up and discharge procedures?
- If patients are admitted to the health facility, what service units/departments might be involved in their care and treatment?

Understanding Staffing Needs

Understanding normal daily routine of staff and diagnostic practices, and identifying point of contact(s) (POC), will ensure that PREDICT procedures fit in as seamlessly as possible into the normal clinic routine.

- What is staff workload like?
- Who is your POC(s) to help identify symptomatic individuals?
- Who is your POC(s) for recruitment of appropriate individuals?
- Who may be best suited for assisting with study procedures, including sample collection and administration of questionnaire?
- Are these POC(s) likely to be the same person or different?
- What will be the best way to engage and train staff about study procedures and protocol?
- Are clinical staff skilled in proposed sampling procedures?
- How will costs for staff time at hospitals be covered and implemented?

The team should identify how PREDICT activities will fit into hospital workflow and develop an implementation plan that will need to be agreed upon with the hospital team. Decisions will need to be made about whether current hospital staff will be assigned additional duties or whether a new staff person(s) will be hired.

A detailed implementation plan, taking into consideration the following issues, should be developed with participating hospital staff:

- What are some potential barriers to implementation?
- What level of visibility and follow-up will be appropriate to keep sites engaged for the duration of the study?
- How will you maintain clear and open communication with health facility staff?
- What is the plan if key personnel involved in implementation leave the health facility?
- How will you take into consideration any known or observed differences religious/ethnic/immigration status in targeting individuals for recruitment?
- How will you monitor for adverse events?

Section 5.4.4. Patient Recruitment in Hospitals and Clinics

PREDICT targets patients that have been recently admitted to clinics and hospitals with acute conditions that match the case definitions for undiagnosed febrile syndromes of likely viral origin. **The objective of PREDICT's testing strategy is to detect novel viruses that are causing diseases in patients without a known etiology.** PREDICT testing should not overlap or duplicate diagnostic testing already being conducted at the hospital.
In communications with clinic medical staff, clinic administration and patients who might be enrolled, it is critical to note that **PREDICT's testing strategy will not directly inform on patient diagnoses or treatment. Our testing strategy is exploratory at the community level and not designed as a point of care diagnostic platform for normative (known) diseases.**
Case definitions should be reviewed closely with hospital POC(s) in advance of study implementation to identify patients for enrollment. Patients for enrollment may be identified in the emergency room, in the ward, or in the intensive care unit of each participating clinic and hospital. The POC(s) at each location should use the **clinical case definitions below** to target potential participants. Case definitions for syndromes have been standardized with those commonly used by WHO and CDC to allow national health authorities to interpret data in an international context.

Syndromic Category Clinical Case Definitions

Surveillance should be designed to target specific syndromes as appropriate in each clinical setting. Identification of relevant syndromes for each facility should be done on a facility-by-facility basis with participating partners and facility staff. Selected syndromes should reflect 1) high priority undiagnosed syndromes with likely animal origins, and 2) the clinical caseload of the hospital or clinic so that a large number of patients with targeted syndromes can be enrolled. Additionally, targeted syndromes should take into account local needs and seek to not duplicate ongoing syndromic surveillance programs by other partners at the clinic or hospital.

In larger referral hospitals with high caseloads, enrollment of patients in the PREDICT study will most likely want to focus on the following three severe syndromes and clinical case definitions to better target individuals with potentially unknown viral pathogens of concern:

1. **Severe Acute Respiratory Illness (SARI) of unknown origin:**
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days
AND cough
AND requires hospitalization (or referral to a hospital)
AND absence of a more likely clinical explanation.

2. **Acute Encephalitis Syndrome (AES) of unknown origin:**
Acute onset of a fever (greater than or equal to 38°C or 100.4 °F) within the last 5 days
AND clinical signs consistent with meningitis, encephalitis, acute flaccid paralysis, or other

acute signs of central or peripheral neurologic dysfunction, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

3. **Hemorrhagic fever of unknown origin:**
Acute onset illness with a fever greater than or equal to 38°C (100.4 °F) within the last 5 days in a severely ill patient
AND clinical findings of bleeding or hemorrhage with no apparent cause
AND one or more of the following clinical findings: 1) severe headache, 2) muscle pain, 3) rash on the trunk within 3–4 days after rash onset, 4) vomiting, 5) diarrhea, 6) abdominal pain, or 7) pharyngitis, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

See also http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=893&DatePub=2010-01-01

In smaller rural clinics, with limited diagnostic capabilities and lower patient caseloads, it may be appropriate to enroll a broader range of patients with suspected illness of unknown origin. In these circumstances, the following 2 clinical case definitions, for less severe and less specific syndromes, may be appropriate to target in addition to the severe syndromes targeted above.

4. **Fever of Unknown Origin (FUO):**
A temperature greater than or equal to 38°C (100.4 °F) for more than 24 hours as reported or measured by the patient or a health-care provider
AND absence of a more likely clinical explanation or failure to reach a diagnosis.

5. **Influenza-like Illness (ILI) of unknown origin**:
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days.
AND cough
AND absence of a more likely clinical explanation.

Be sure to follow the most up-to-date version of the PREDICT Master IRB protocol with respect to all procedures, including recruitment, enrollment, inclusion, and exclusion criteria, and sample sizes.

Additional Enrollment Criteria and Considerations

PREDICT and hospital/clinic staff must take special care to ensure that patient recruitment and enrollment is not adversely impacting patients seeking medical care, or hindering patients' ability or willingness to seek medical care in any way. Recruitment and enrollment of patients should only occur after patients have established access to health services. Patient recruitment for this study should not be linked to patient intake or admission. Enrollment must be completely voluntary.

Eligible individuals should be recruited as soon as safely possible after presentation to the health facility, and after initial screening to ascertain whether patients meet the above clinical case definition, in order to maximize the utility of the biologic specimen collected. Successful recruitment of syndromic individuals will require monitoring of incoming patients to health facilities. Recruitment from health facilities involves many coordinated steps, involving coordination between PREDICT and health facility staff.

In addition to the clinical case syndromes identified above, inclusion and exclusion criteria outlined in the approved Master IRB protocol that must be applied to all PREDICT studies is reiterated below:

Additional Inclusion Criteria	***Exclusion Criteria***
1. Adults (18 years of age or greater) who provide informed consent	1. Individuals aged 18 years or older who refuse to provide informed consent, a parent or guardian of a child who refuses to provide consent on behalf of their child, or a child 12 years or older unable or unwilling to provide assent
2. Children (2 -17 years of age) * with an accompanying parent or guardian who is able to provide informed consent. Assent of children 12 years or older also required.	2. Adults unable to provide informed consent, including individuals with physiologically or medically induced cognitive impairments. **
3. Pregnant women	3. Children without an accompanying parent or guardian who is able to provide informed consent
	4. Children < 2 year of age
	5. Prisoners

**Children defined as 2-17 years unless the age of majority in a participating country differs. In these cases, the age range for children will be listed in the country specific IRB protocols.*

***Patients who are incapacitated and unable to provide informed consent may be enrolled if an appropriate patient representative (e.g., family member) is present, willing, and able to provide consent on the patient's behalf. If, in the course of study operations, such a patient become capable of providing informed consent, the patient will be directly consented.*

Section 5.4.5. Determining the Number of Patients to Enroll in Clinical Settings

Estimated sample sizes of patients approved in the Master IRB is a maximum of 1,620 in each country for syndromic surveillance activities over the course of the project. Any deviations from this total estimate will need to be reviewed and authorized by the UCD IRB (See Section 5.8.1b).

Patients meeting targeted case definitions should be enrolled systematically across the year so that the patient population is sampled across all relevant seasons. Monthly sample sizes throughout the year should reflect a consistent proportion of patients meeting targeted case definitions.

In general, patients should be enrolled using a quota system until approximately 20% of the participants are children < 18 years of age and 80% are adult. For larger hospitals and clinics, interval sampling will be implemented by selecting every N^{th} case at the site among those individuals who meet enrollment criteria. The interval should be determined by country teams based on an evaluation of the expected number of cases presenting at the site within a given year in order to best meet study design and sample size criteria. For example, in a large hospital with many patients meeting enrollment criteria, the first patient meeting criteria would be selected for study participation followed by selection of every 3^{rd} or 5^{th} individual (depending on the appropriate interval) until the maximum sample size is obtained.

Procedures for Patients in Hospitals and Clinics

Section 5.4.6. Overview of Procedures in Hospitals and Clinics

PREDICT and hospital/clinic staff should consider and make arrangements to conduct the following steps. These steps may need to be adjusted depending on the circumstances of each enrolled health facility. An overview is summarized below for ease of use in training PREDICT staff. Details for each procedure are described further below and in the IRB protocol.

Outline of Activities Involving Patients:

1. **Patient Triage and Intake**: Patients arrive at health facilities and present to patient triage and/or intake units. Clinic or hospital POC(S) will assess patient etiology as part of their normal routine. Following patient triage and intake, patients with presenting syndromes of interest will need to be actively referred to PREDICT POC(s). This active referral will deviate from the health facility staff's normal routine. Country coordinators will need to establish a protocol with the health facility staff prior to beginning recruitment and *ensure that this process does not negatively impact patient access to health services, or health facility workflow*.

2. **Administer Informed Consent**: Patients determined eligible via the Screening Form will be offered participation in PREDICT. Study staff will administer the informed consent form to interested patients. *No study procedures can be conducted without having first obtained informed consent.* Informed consent must happen in a private space and should not involve anyone other than research staff, the patient, a representative if the patient is incapacitated, an impartial witness if the participant is illiterate, and a

parent/guardian if the patient is a child. Once consented, the patient is considered an enrolled participant.

Note: The presence of clinical staff directly involved in patients' care during the consenting process should be construed as coercive. Patients may think they need to consent in order to continue receiving care. PARTICIPATION MUST BE STRICTLY VOLUNTARY.

3. **Collect PREDICT Specimens**: Once enrolled, PREDICT POC(s) will coordinate human biologic specimen collection. Samples may be taken concurrently when collecting samples for normative diagnostics or independently.

4. **Administer Human Questionnaire**: Study staff will administer the **standardized IRB approved human questionnaire to all enrolled participants** at a point in time that ensures patient privacy and is not disruptive to patient care. The human questionnaire must be administered to all patients from which a biologic specimen is collected.

   In clinical settings with critically ill patients, the full human questionnaire may not be possible or appropriate to administer. At a minimum, the "**Core Human Questionnaire" (pages 1-6 of Human Questionnaire)** and the **Human Hospital & Clinic Module** for Patients should be completed.

5. **Normative Diagnostics**: Throughout a patient's inpatient stay, a variety of normative diagnostics, if available, might be run by the health facility staff to determine patient etiology. If additional sampling procedures are conducted as part of normative diagnotics that do not overlap with PREDICT specimen types already collected, PREDICT may request that any unused or remaining diagnostic specimen types be saved from patients enrolled in the PREDICT study (such as cerebral spinal fluid, pleural fluid, etc) to expand the sample set for PREDICT testing.

   Once health facility staff obtain diagnostic results, patients' etiologies will be updated. This information can be used to prioritize samples for testing with PREDICT viral family protocols. If an etiology for fever or clinical syndromes is identified, samples from this patient are of lower priority, unless a novel viral infection is still suspected because the objective of PREDICT's testing strategy is to detect novel viruses that are causing disease in patients. PREDICT POC(s) will need to follow the inpatient progress of enrolled participants to know when etiologies are updated.

6. **Second PREDICT Serum Specimen Collected**: 7 days after the first sample collection or later, an additional serum sample (the discharge serum) should be obtained from participants when possible.

Section 5.4.7. Administering Informed Consent

Participation of human subjects in the study will be strictly voluntary and will require signed, informed consent. All consent discussions and procedures will be conducted in a private room or location with a trained staff member fluent in the local language. Only the PREDICT staff person/POC and the patient will be present during the consent process. Additionally, the patient's representative if the participant is incapacitated, an impartial witness if the participant is illiterate, and/or the patient's parent or guardian if the patient is a child, can be present during the consent process. CITI-trained PREDICT staff may occasionally observe consent procedures to ensure they are appropriately and thoroughly conducted.

All participants will be given an information sheet and consent form prior to being asked to participate in this study. Potential participants will review the information sheet and consent form with the PREDICT POC(s) and will be given time to ask questions. During the review, POC(s) will explain details of the study, including:

- Purpose of the study,
- Why they were selected,
- What will happen if they enroll in the study,
- Potential risks due to their participation,
- How their participation is beneficial to understanding viral pathogens in the community,
- That their participation is completely voluntary,
- How they can withdraw their participation at any time,
- How participation in the study will not interfere with, nor affect, their routine medical care in the health facility,
- How PREDICT testing is exploratory research, and not diagnostic, and this will not inform on patient diagnosis or treatment.
- Test results, these will not be directly communicated back to the participant

PREDICT Study staff POC(s) will review the consent form with participants, answering any questions participants have. It should be made clear to all participants that any data or information collected will be kept strictly confidential. Measures will be taken to ensure the respect, dignity, freedom, and privacy of each participant. PREDICT POC(s) involved in the enrollment and recruitment of participants must avoid coercion of any kind. The PREDICT representative conducting informed consent procedures will not enroll the participant in the study unless confident that the participant or his or her representative fully understands the study and all potential associated risks and benefits.

After reviewing the forms and discussing the study, individuals who agree to participate will sign and date two copies of the consent form, and the staff member conducting the consent discussion will also sign and date the consent forms. If the participant is a child, he or she will

be asked to provide assent to participate in the study and the patient's parent or guardian will sign and date the consent forms. If the patient is illiterate, the witness will sign and date two consent forms. If the patient is incapacitated, his or her representative will sign and date the consent forms. The patient will be given a copy of all consent documents.

Section 5.4.8. Brief Overview of PPE

Minimum PPE Required for Safe Human Specimen Collection
The minimum PPE used by healthcare professionals for human sampling should follow the CDC and other international guidelines for best practices and precautions.

The following are the minimum PPE requirements:

- Gloves
- Designated clothing (which may include gown, apron, long sleeve lab coat)
- Closed-toed shoes
- Eye protection (glasses or goggles), face mask or shield

(See the PREDICT ***Biosafety and PPE Guide (Section 4.1)*** for detailed instructions regarding PPE Use.)

Section 5.4.9. Collecting Clinical Specimens

Enrolled patients who satisfy inclusion criteria as described above (with signed consent form) will be asked to provide clinically relevant biological specimens based on clinical symptoms. To ensure patient privacy, no identifying information from patients will be stored with, or paired with, biological specimens or test results.

Patients should be enrolled with specimens and data collected within 3-5 days of onset of symptoms if possible, and not longer than 10 days after onset becase we are targeting viral etiologies. Critically, patients must have specimens collected as soon as possible after admission in order to ensure they are captured in the viremic phase and/or while they are still shedding the virus, if the illness turns out to be of viral origin. If feasible, hospitalized patients may have repeated serum samples collected at seven days after enrollment, or later before discharge.

Biological samples may only be collected by trained personnel certified by the country's authority for certification of medical professionals. All personnel collecting or handling PREDICT biological specimens must wear appropriate PPE and practice Universal Precaution procedures.

Study representatives should conduct activities in a secure location and a confidential

manner to ensure participant privacy. A barrier or private room should be utilized so that participants cannot be seen by outside observers while they are being sampled. During and immediately after sample collection, trained medical professionals and/or clinic staff will monitor specimen collection site(s) and treat any complications according to existing health facility protocols.

Summary of Clinical Specimen Types

The decisions about which specimens to collect should be based on the patient's clinical symptoms (eg. blood and oral/nasal swabs for respiratory patients;):

- 2 x Oral or Nasal or Oropharyngeal swabs - one in 500 µL VTM and one in 500 µL Trizol
- 2 x Whole blood samples - one with max of 500 µL of whole blood in 500 µL VTM and one with max of 500 µL of whole blood in 500 µL Trizol
- 2 x Serum samples - 2 x 500 µL aliquots, frozen without media
- 2 x Urogenital swab samples – one swab each in 500 µl VTM and 500 µl Trizol
  OR
  2 x Urine samples - one 500 µL urine sample each in 500 µL VTM and in 500 µL Trizol
- 2 x Rectal swabs - one swab in 500 µL VTM and one in 500 µL Trizol
  OR
  2 x Fecal samples - 0.5cc (pea size) feces in 500 µL VTM and 0.5cc (pea size) feces in 1 mL Trizol
- Additional samples or aliquots of specimens collected for standard normative diagnostic purposes by hospital staff may be requested, as appropriate and based on clinical symptoms (see below).

Whole Blood and Serum

Trained phlebotomists, doctors, or nurses will collect venous blood samples by standard venipuncture from the right or left antebrachium.

A minimum of two blood samples will be collected from each participant. Collect one sample into a vacutainer tube containing serum separator and the other into a vacutainer tube containing EDTA. For children aged 12 years or younger, collect a maximum of 6mL in each tube. From individuals aged 13 years and older, collect a maximum of 12mL per tube.

Ensure adherence to appropriate PPE while handling biological specimens.
Allow blood in the red top or serum separator tube to clot, then centrifuge. After clotting and centrifugation, aliquot a minimum of two (and up to four) 0.5 mL aliquots of serum into individual cryovials without Trizol or VTM.

From the EDTA lavender top tube, place up to 500 µL whole blood directly into 2 vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each vial well.

Samples will be frozen immediately in liquid nitrogen and then transferred to an ultralow (-80°C) freezer as soon as possible for storage until analysis.

Note that two blood sampling events are warranted if feasible in a hospital or clinic setting, one on the day of enrollment and one seven days after enrollment or later (before discharge), to collect a serum sample only. If serologic assays are available for use for targeted viruses, a rise in IgM with convalescence might assist in establishing causality with disease syndromes.

Oral, Nasal, or Oropharyngeal Swabs

Each patient may have duplicate oral, nasal, or oropharyngeal swabs collected on the day of enrollment to the study.

Oral and nasal swabs will be collected by applying a sterile, flexible, nylon-tipped swab to the appropriate tissue and gently rubbing for 2-5 seconds. Oropharyngeal swabs will be collected by medically trained personnel by gently inserting sterile, flexible, nylon-tipped swabs into the pharyngeal cavity for 2-5 seconds and rotating while removing, as is done for diagnostic procedures.

Place each swab into its own vial, one containing 500 µL VTM and one containing 500 µL of Trizol, mix each tube well, and freeze immediately.

Rectal Swab or Feces

Rectal swabs will be collected by gently inserting 2 sterile, flexible, nylon-tipped swabs into the anal canal, moving them from side to side, and rotating while removing. Place each swab into a vial, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

If patients are to provide a stool sample instead, they will be provided containers labeled with their individual ID number and instructions on how to collect an uncontaminated fecal sample, including appropriate guidelines for hand washing after sample collection.

Add 500 µL (a pea-sized piece) of feces directly into each of two vials, one containing 500 µL VTM and one containing 1ml Trizol. Mix each tube well and freeze immediately.

Urogenital Swab or Urine

A urine sample will be collected in a sterile universal container. Patients will be provided containers labeled with their unique ID numbers and instructions on how to collect an uncontaminated urine sample, including appropriate guidelines for hand washing after

sample collection.

Add up to 500 µL of urine directly into each of two vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each tube well and freeze immediately.

If urine can't be obtained, collect two urogenital swabs and place into two vials, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

Additional Samples

For hospitalized patients, PREDICT also may receive remnants or aliquots of appropriate clinical specimens that have already been collected for diagnostic purposes. PREDICT testing should be conducted on remaining sample aliquots only after standard diagnostic procedures have been completed to ensure PREDICT activities do not interfere with patient care. These samples may include urogenital swabs, cerebral spinal fluid (CSF), pericardial fluid, pleural fluid, ocular swabs, or others. PREDICT should collect these remnants or aliquots in keeping with the respective participant's clinical symptoms, for instance, pleural fluid would be sourced from participants with respiratory distress, CSF from participants with encephalitis, etc. These samples can be frozen at −80 °C without Trizol or VTM. If additional PREDICT analyses are done on hospital diagnostic screening samples, results will not be communicated to patients or participating health facilities.

Section 5.4.10. Medical History and Behavioral Risk Data Collection in Clinical Setting

All enrolled patients will complete the required elements of the ***Human Questionnaire*** and the ***Human Hospital and Clinic Module for Patients***. If appropriate given the clinical setting and patient condition, the full PREDICT Human Questionnaire with all relevant modules can be completed.[1]

Questionnaire data will be collected by trained staff in a strictly confidential manner. Individual interviews will be conducted in private with no other individuals within a 10-foot distance, ensuring that others cannot hear the interviews. A barrier will be created so that no other individuals can view the participant while they are in their interview. Staff will take care to pair interviewers and respondents by sex to ensure protection of women and children and privacy

[1] To access the Human Questionnaire and desired module bubble forms, log in to EIDITH at https://connect.eidith.org/. Click the "Download Bubble Forms" button and select "Human Questionnaire" under the Choose Type drop-down menu. Select the Questionnaire or module you wish to download, indicate the number of forms you would like, and press "Submit." When prompted to do so, click on the word "here" to download your form/s. Additional instructions for completing and uploading the forms may be found in the Videos and Instructions menus on the connect.EIDITH.org dashboard.

and confidentiality of responses. Children will not be interviewed in the absence of a parent or guardian.

As many questions are sensitive in nature, the presence of support persons may make it difficult for participants to feel comfortable answering questions honestly. PREDICT POC(s) should liaise with clinical staff and family members for critically ill participants, as appropriate, to determine the most patient-centered means of collecting sensitive data, while still maintaining the accuracy of the data collection methods.

Where participants are intubated and unable to communicate verbally, but alert and appropriately communicative, POC(s) may administer the human questionnaire using paper and pencil with participants, if possible. Where patients are sedated and/or comatose, a shortened version of the questionnaire may be completed with a family member or substitute decision maker, if deemed appropriate by all parties. The human questionnaire must be completed if a biologic specimen is drawn; therefore, if the POC(s) is unable to complete the questionnaire for any reason with a participant, they will be excluded from the study. In all instances, the decision to complete the human questionnaire with critically ill individuals must weigh the benefits and downsides with family/friends, clinical staff, and the research team. The POC(s) must also consider patient privacy in immobile or critically ill participants and deem if there is appropriate space in which to conduct the questionnaire to ensure privacy and confidentiality.

Participants may be given a small token of appreciation for participation in the study that is appropriate with local culture and customs and valued at no more than $10 USD. Local research teams will determine the most appropriate item to give as a token of gratitude to research participants. This item should be given to participants after consent and baseline sampling and interviews are complete.

Section 5.4.11. Record Maintenance and Ensuring Participant Privacy

A study participant log should be maintained at each site to track participant enrollment. Information on new participant enrollments should be added to the log in a timely fashion after their consent; the enrollment of pregnant women and children, in particular, should be noted. If, after signing a consent form, a participant decides that they wish to withdraw from study activities, this information must be recorded in the participant log. In addition, each site may wish to maintain a confidential linking log that links participant names to their unique identification number; this log should also be maintained in an up-to-date manner, with information on study enrollees added shortly after their consent. An example participant log is attached in Appendix III.

No identifying information from patients will be stored with or paired with questionnaire data, biological specimens, or analytical test results. Further, identifying information must not be stored electronically and must be stored securely in locked drawers or cabinets in areas accessible only by PREDICT staff. When questionnaires are moved to the country headquarters,

they will contain only coded data to ensure the safety and confidentiality of participants and will be maintained in a secure database. The only document that will link the participant with a unique ID number is the consent form, which will be stored in a locked file separately from participant data in the offices of the Country Coordinator.

Section 5.4.12. Reporting Results

The PREDICT team will inform collaborating partners of the aggregate patient test and behavioral risk findings as well as provide information about viral detection and zoonotic diseases detected, as appropriate. One key benefit of this study to participating clinics and hospitals is to enhance understanding of viruses that could be causing syndromes in local people but that have previously gone undiagnosed. This information will inform participating clinics and hospitals about viruses common in target patient communities and may lead to practices that could reduce exposure and health risks.

Report summaries of interpreted data generated from the project will be provided to the Ministry of Health for approval for release. Following approval for release, report summaries from the project can be shared with other in-country collaborating investigators and hospitals. Adverse events or serious adverse events will be included in report summaries provided to Ministries of Health upon request.

Section 5.4.13. Protocol Deviations, Unanticipated Problems, and Adverse Events

For complete information on protocol deviations, unanticipated problems, and adverse events, see the PREDICT Compliance and Monitoring Guide.

Protocol Deviations
Country teams and hospital and clinic POCs responsible for conducting PREDICT surveillance activities must be familiar with PREDICT's IRB protocols and knowledgeable about expected human surveillance operations. If, during the course of study activities, a team member becomes aware that any human surveillance activities have not been conducted in accordance with protocols or training guides, the team member should promptly inform the country field coordinator/human surveillance officer (if one is active in the country) or Country Coordinator about the deviation. The Country Coordinator should promptly contact the regional lead and complete any documentation, including developing any Corrective and Protective Action plans.

Unanticipated Problems
Unanticipated problems are events that are **unexpected** and **related to the research study** and that put one or more study participants at **greater risk of harm**. Unanticipated problems can include events or issues arising during standard research operations that may not cause detectable harm or adverse effects to research participants, but nonetheless raise the level of

risk associated with research participation (e.g., stolen consent forms or linking logs; breaches of privacy during research interviews). All problems meeting the three criteria above must be reported to the Operations Officer (predict@ucdavis.edu) within 24 hours (if the unanticipated problem is serious) or 72 hours (if the problem is not serious) using the form in Appendix IV.

Adverse Events and Serious Adverse Events

It is possible that during the course of study activities, a participant may experience discomfort or distress. Certain discomforts, such as pain at the site of blood collection and discomfort answering sensitive questions, are expected and detailed in the study protocol. Additional possible risks to study participation may be identified for a given site upon consultation with a local risk expert.

If, during the course of study operations, a participant reports or exhibits one of these anticipated adverse reactions to study participation (be it physical, mental, emotional, or social), that adverse reaction, or "adverse event," should be documented and reported to the human surveillance/field coordinator (if one is active in the country) and Country Coordinator promptly, but no later than within five working days (see the Reportable Information, Unanticipated Problem, and Adverse Event Reporting Form, Appendix IV). Once the Country Coordinator learns of the Adverse Event, he or she should report it to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) within **72 hours**.

In the event a participant reports or exhibits a ***serious*** adverse event that is ***unexpected,*** that is likely ***related*** to study activities, and that implies the ***level of risk to all study participants may be higher than previously expected***, that serious adverse event should be reported to the human surveillance/field coordinator (if one is active in the country) or Country Coordinator within five working days. The human surveillance/field coordinator should report the event to the Country Coordinator, and the Country Coordinator should report the event to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) **within 24 hours**.

The Lead PREDICT PI and Operations Officer are responsible for notifying the UCD IRB within the same time frame (72 hours for adverse events; 24 hours for serious adverse events). The Country Coordinator should report these adverse events to the in-country IRB or ethical committee if and as required to do so.

After becoming aware of any adverse event, the Country Coordinator should confer with their regional lead, the PREDICT global team, and relevant IRBs/ethical boards to determine what steps, if any, should be taken to address the adverse event and prevent similar future events.

Section 5.4.14. Site Monitoring

Each in-country team should work together in the first year to implement key procedures from the PREDICT IRB Compliance and Monitoring Guide on site monitoring and reporting (summarized in Appendix 5). Country Coordinators will be expected to work with PREDICT POCs at hospital and clinic sites to develop a regular system for transferring key study documents, reviewing records for completion, and addressing issues or concerns that arise during study activities.

As part of monitoring and reporting plans, at the completion of each surveillance period, generally on a calendar year schedule, a data and safety review will be conducted by a representative of the PREDICT global or regional management team. At this review, safety information and adverse events collected during the performance period will be discussed and addressed. Data may include case report forms, notes from study visits, and or any telephone calls to the PI from participants.

Section 5.4.15. References

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Section 5.4.16. Appendix I. PREDICT IRB Checklist for UC Davis Submission

Before initiating human surveillance activities described in the Master Protocol, the following items must be submitted to the PREDICT Global Team via predict@ucdavis.edu prior to submission to local IRBs or ethical committees. The Global Team will conduct a rapid internal review of these documents to ensure plans comply with project objectives and global IRB approvals.

Following local IRB or ethics committee approval, additional materials must also be shared with the Global Team to forward onto the UC Davis IRB for final review and approval of country activities.

The most current drafts of global IRB-approved documents, including the currently approved protocols, consent forms, and questionnaires, are available at: http://eidith.org/Resources/PREDICTIRBProtocols.aspx (EIDITH login required).

Submission Checklist:

☐ 1. Submitted a bulleted list of changes made to all global document(s) to predict@ucdavis.edu.

☐ 2. Shared the country plan developed on the PREDICT global protocol template (using Track Changes as descried in the instructions) with predict@ucdavis.edu.

☐ 3. Used the most recent version of the Master Protocol documents (available at http://eidith.org/Resources/PREDICTIRBProtocols.aspx) to develop in-country materials.

☐ 4. Submitted English language versions of the country protocol, written consent form, verbal consent form, introductory script, and human questionnaire (Word.doc preferred) to predict@ucdavis.edu. Provided English language versions of any printed advertising materials to predict@ucdavis.edu.

☐ 5. Provided in-country IRB submission requirements (in copy or by web link, or if not in English via a document explaining the requirements) to predict@ucdavis.edu.

☐ 6. Clearly listed all Country Coordinators, Human Surveillance Coordinators, Global Leads, and key US-based staff involved in the study in the country protocol personnel list. These individuals will require CITI training.

Following Country-Level Approval – The Post-Submission Checklist:

☐ 1. Submitted all documentation of local IRB/ethical approvals to predict@ucdavis.edu. *All countries to submit this documentation.*

☐ 2. Provided all translated documents to predict@ucdavis.edu. For countries using town hall recruitment methods, this includes (a) translated study introduction letter(s) and recruitment script(s).

☐ 3. Submitted CITI training certificates for all personnel listed in the country protocol to predict@ucdavis.edu and entered all CITI training events to the EIDITH training app for monitoring (EIDITH app: http://training.eidith.org).

☐ 4. Trained all members of the human subject research team (training conducted by CITI-certified personnel) in human research ethics, and entered documentation of training events into the EIDITH training app (http://training.eidith.org). *Please maintain a record of all personnel involved in the study to allow monitoring of training status via the EIDITH Training Dashboard.*

☐ 5. Trained all relevant staff in PREDICT biological specimen safety protocols and entered documentation of all training events into the EIDITH training app (http://training.eidith.org). In addition, identified all local requirements for biological specimen safety (if any) and communicated requirements with study staff.

☐ 6. Identified and addressed local IBC requirements (if any) and shared a document outlining these requirements with predict@ucdavis.edu.

☐ 7. Conducted a consultation with a local expert on risks of human subject research in the study area; communicated these risks to the global and human surveillance teams for consideration.

☐ 8. Submitted a signed attestation form to predict@ucdavis.edu (see instructions) indicating that all personnel will adhere to all US federal and state regulations related to the protection of human research subjects.

Section 5.4.17. Appendix II. Health Facility Screening Form

Health Facility Screening Form

Facility Description

Type of Facility:
- ☐ Clinic
- ☐ Hospital
- ☐ Other_____

On-Site Facilities:
- ☐ Inpatient Unit (_____ beds)
- ☐ Emergency Department (_____ beds)
- ☐ Intensive Care Unit (_____ beds)

Facility Operating Hours:

Sunday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Monday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Tuesday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Wednesday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Thursday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Friday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Saturday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs

Facility Departments:
- ☐ Chemistry Lab
- ☐ Microbiology Lab
- ☐ Radiology Department
  - ☐ CT Scanner
  - ☐ MRI Machine
  - ☐ Ultrasound Machine
  - ☐ X-ray Machine
- ☐ Transfusion Medicine Department

Direct Disease Reporting:
- ☐ Regional Reporting
- ☐ Country Reporting
- ☐ International Reporting

On-Site Personnel:
- ☐ Physicians (_____ staff)
- ☐ Nurses (_____ staff)
- ☐ Infectious Disease (_____ staff)
- ☐ Phlebotomy Team (_____ staff)

Health Care System

Coverage of Care:
- ☐ Fixed-Cost for Patients
- ☐ Sliding-Scale for Patients
- ☐ Free for Patients
- ☐ Supplemented Only if Patient has Private Insurance
- ☐ Location-Specific

Patients Served

Geographic Areas Served by Medical Facility:
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Presentation of Syndromes of Interest (Last Month):
- ☐ Fever of Unknown Origin (_____ patients)
- ☐ Fever with Rash (_____patients)
- ☐ Fever with Diarrhea (_____patients)
- ☐ ILI/SARI (_____patients)
- ☐ Encephalitis (_____patients)
- ☐ Hemorrhage (_____patients)

Diagnostics

Health Facility Screening Form

Normative Diagnostics:

Chikungunya	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Cholera	☐ On-Site Rapid	☐ Stool Culture	☐ Off-Site	☐ None
Dengue	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Hantavirus	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Influenza	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Japanese Encephalitis	☐ On-Site Rapid	☐ Cerebrospinal ELISA Test	☐ Off-Site	☐ None
Malaria	☐ On-Site Rapid	☐ Microscopic Examination	☐ Off-Site	☐ None
Tuberculosis	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Typhoid	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Yellow Fever	☐ On-Site Rapid	☐ PRNT Test	☐ Off-Site	☐ None

If Off-Site, Where?_____

Specimen Collection Capability

Fluid Collection
- ☐ Blood Sample
- ☐ Fecal Sample
- ☐ Urine Sample

Mucosal Collection
- ☐ Nasal Swab
- ☐ Nasopharyngeal Swab
- ☐ Oropharyngeal Swab
- ☐ Anal Swab

Other Samples
- ☐ Ocular Swab
- ☐ Sputum Sample
- ☐ Cerebrospinal Fluid
- ☐ Pericardial Fluid
- ☐ Pleural Fluid

Patient Care

Referral Process:

Are Patients Ever Referred Out for Care?
☐ No ☐ Yes (where: _____)

If Yes, Is There Active Patient Follow-Up?
☐ No ☐ Yes

Patient Health Records:
- ☐ Paper
- ☐ Electronic

Research Capacity

Experience with Research:

Facility Actively Conducts Research
☐ No ☐ Yes

Facility Collaborates with External Researchers
☐ No ☐ Yes

On-Site Cold Storage:
- ☐ Refrigerator (4C)
- ☐ Freezer (-20C)
- ☐ Deep Freezer (-80C)

Section 5.4.18. Appendix III Sample PREDICT Participant Enrollment Log

Participant ID Number	Consent / Enrollment Date	Pregnant Woman? (Y/N)*	Child / Minor? (Y/N)*	Date Human Questionnaire Completed	Biological Samples Provided? (Y/N)	Ethnographic Interview? (If Yes, date)	Focus Group? (if Yes, date)	Withdrawn consent? (Y/N)	Withdrawn due to AE?** (Y/N)

*If a participant is **both** pregnant **and** a minor, they should be marked in the child/minor category **ONLY**
**AE – Adverse Event

Enrollment Log Page Number _____

Section 5.4.19. Appendix IV PREDICT Reportable Information, Unanticipated Problem, and Adverse Event Reporting Form

Form is embedded in PDF document (pp. 26a and 26b, below) and available as a standalone document in the PREDICT EIDITH online Operating Procedures EBook.

USAID | PREDICT
FROM THE AMERICAN PEOPLE

PREDICT Reportable Information, Unanticipated Problem, & Adverse Event Reporting Form

Reportable information (RI), unanticipated problems (UPs), adverse events (AEs), and serious adverse events (SAEs) arising in the course of PREDICT operations must be documented and reported to PREDICT Global staff at UC Davis. These reports help PREDICT and ethical review boards ensure that study participation does not pose unacceptable levels of risk to participants. This form should be used to report one instance of reportable information, one unanticipated problem, or one adverse event. The form may also be used to provide new, additional information on an existing report.

If providing new information on an existing report, please reference the date and provide a brief description of the previous report.

Please report all RI, UPs, AEs, and SAEs to your c ountry coordinator within THREE (3) business days if the event is not serious and ONE (1) day if the event is serious (see reverse for definitions).

Country coordinators should report RI, UPs, AEs, and SAEs to within THREE (3) days (if not serious) or ONE (1) day (if serious).

1. The report following describes (please check all that apply)

☐ Reportable Information ☐ an Unanticipated Problem ☐ an Adverse Event

☐ New information from a previous report.

Original report date: _____

2. Date of report: _____

3. Date(s) of event: _____

4. Date of event discovery: _____

5. Please provide a brief description of the event:

6. Did any of the following occur? (Check all that apply)

- ☐ Non-compliance with IRB requirements or determinations, or allegations of such non-compliance*
- ☐ Protocol deviation due to the action or inaction of the investigator or research staff*
- ☐ Breach of confidentiality*
- ☐ Death of participant
- ☐ Event is life threatening/places the subject at immediate risk of death
- ☐ Inpatient hospitalization or prolongation of existing hospitalization
- ☐ Persistent or significant disability/incapacity
- ☐ Congenital anomaly/birth defect
- ☐ Subject's health in jeopardy; may require medical, counseling, or surgical intervention to prevent one of the other outcomes listed above
- ☐ Criminal or civil liability or damage to the subject's financial standing, employability, or reputation.

7. Relatedness to study procedures, by principal investigator (PI) determination (Please select one)

- ☐ Unrelated: cause of problem is known; problem is not related to study procedures
- ☐ Possibly related: Less than likely (≤ 50%) chance of relatedness to study procedures; relation to study procedures is unclear but cannot be ruled out.
- ☐ Probably related: More than likely (≥ 50%) chance of relatedness to study procedures;
- ☐ Definitely related to study procedures: clear association in time with study procedures; no likely alternative cause

8. Outcome

- ☐ Resolved with no further problem/complaint
- ☐ Resolved with additional problem/complaint
- ☐ Hospitalization
- ☐ Death
- ☐ Unresolved at time of study close-out

Definitions:

Reportable Information includes **any new information that indicates the rights, safety, or welfare of participants or others has been or may be compromised** by something that occurred or did not occur in relation to study activities. Reportable information may include (but is not limited to) protocol deviations, participant complaints, safety monitoring reports, and changes to research conditions that pose safety risks.

Unanticipated problems are problems that are **unexpected**, that are **related or probably related** to the study, and that suggest research participation involves a **higher level of risk than was previously anticipated.**

Unexpected means that the **nature**, **severity**, and/or **frequency of the problem was not anticipated** given the study population and the nature of the IRB-approved study procedures. In reference to an AE, "unexpected" means that the nature, severity, or frequency of the problem is inconsistent with the natural progression of any underlying disease, disorder, or condition that the subject may have or with the participant's predisposing risk factor profile for the AE.

Adverse events are any **unfavorable occurrences** (including physical, mental, emotional, and social) that the participant experiences during or as a result of study activities.

*Requires additional completion and submission of a Corrective and Preventive Action (CAPA) Plan.

Signature_____ Date _____

Section 5.4.20. Appendix V. IRB Compliance Responsibilities and Expectations

(PENDING)

- Sample of a human survey questionnaire: Camel Exposure Module – English (see next page)

Camel Exposure Module – English

STUDY ID: _____

Q1. Have you taken this questionnaire in the past?

◯ NEVER

◯ YES – IN 2018 AT THIS LOCATION

◯ YES – IN 2018 AT A DIFFERENT LOCATION

◯ YES – IN 2017 AT THIS LOCATION

◯ YES – IN 2017 AT A DIFFERENT LOCATION

INTERVIEWER SCRIPT
We will now ask you about recent illnesses you may have had, any hospitals you may have visited recently, different interactions you may have had with camels, and what you think about camels and health.

Q2: Do you feel sick today?

◯ YES ◯ NO

Q3: Do you have a cough today?

◯ YES ◯ NO

Q4: Do you feel like you have a fever today?

◯ YES ◯ NO

↳ IF Q2 OR Q3 OR Q4 = "YES" SKIP TO Q6.

⇨ **Q5: Have you felt sick, had a cough, or had a fever recently?**

◯ NO

◯ IN THE LAST 3 DAYS

◯ IN THE LAST 7 DAYS

◯ IN THE LAST 14 DAYS

◯ IN THE LAST MONTH

↳ IF Q2 & Q3 & Q4 & Q5 = "NO" SKIP TO Q11.
↳ IF Q2 & Q3 & Q4 = "NO" & Q5 ≠ "NO" SKIP TO Q7.

⇨ **Q6. For how many days have you felt sick or had a cough or fever?**

_____ FILL IN NUMBER OF DAYS

↳ IF Q6 IS ANSWERED SKIP TO Q8.

⇨ **Q7. How many days in total did you feel sick or have a cough or fever?**

_____ FILL IN NUMBER OF DAYS

⇨ **Q8. Have you been seen by a doctor or nurse for this condition?**

◯ YES ◯ NO

↳ IF Q8 = "YES" SKIP TO Q10.

⇨ **Q9. Do you plan to be seen by a doctor or nurse for this condition?**

◯ YES ◯ NO

↳ IF Q8 & Q9 = "NO" SKIP TO Q11.

⇨ **Q10. Where did you go or where will you go to see a doctor or nurse for this condition?**

◯ FRIEND OR FAMILY MEMBER WHO IS A DOCTOR OR NURSE
◯ PRIVATE DOCTOR OR NURSE
◯ CLINIC ◯ HOSPITAL ◯ OTHER_____

Q11. When was your most recent illness involving a fever or cough:

◯ NEVER
◯ IN THE PAST MONTH ◯ IN THE PAST 3 MONTHS
◯ IN THE PAST 6 MONTHS ◯ IN THE PAST YEAR
◯ IN THE PAST 2 YEARS ◯ MORE THAN 2 YEARS AGO

↳ IF Q11 = "IN THE PAST MONTH" CHECK THAT Q5 DOES NOT SAY "NO".

Q12. When is the most recent time you have been in a hospital?

◯ I HAVE NEVER BEEN IN A HOSPITAL
◯ IN THE PAST 14 DAYS ◯ IN THE PAST MONTH
◯ IN THE PAST 3 MONTHS ◯ IN THE PAST 6 MONTHS
◯ IN THE PAST YEAR ◯ IN THE PAST 2 YEARS
◯ MORE THAN 2 YEARS AGO

↳ IF Q12 = "I HAVE NEVER BEEN IN A HOSPITAL" SKIP TO Q14.

⇨ **Q13. During your most recent visit to a hospital, what was the main purpose of your visit?**

◯ I WAS A PATIENT ◯ I WAS VISITING A PATIENT
◯ I WORK AT THE HOSPITAL ◯ I WAS VISITING A HOSPITAL WORKER
◯ OTHER_____

INTERVIEWER SCRIPT
Camels are an important part of Jordanian culture, and many people use camels or camel products such as milk in their daily life. We will now ask you about a number of different ways in which you might interact with camels or use camel products in Jordan.

Q14. In a typical week for you, how many camels do you see?

◯ 0 ◯ 1 ◯ 2-5 ◯ 6-10 ◯ 11-20 ◯ 21-50
◯ 51-100 ◯ 101-500 ◯ MORE THAN 500

Q15. In a typical week for you, how many camels are ever within a distance of 1 meter from you? *Interviewer should point to someone or something approximately 1 meter away from the participant to indicate the distance.*

◯ 0 ◯ 1 ◯ 2-5 ◯ 6-10 ◯ 11-20 ◯ 21-50
◯ 51-100 ◯ 101-500 ◯ MORE THAN 500

Q16. Do you drink camel milk?

◯ NEVER
◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q16 = "NEVER" SKIP TO Q19.

⇨ **Q17. Thinking about the last time you drank camel milk; did you or someone else boil the camel milk before you started drinking it?**

◯ YES ◯ NO

IF Q17 = "YES" SKIP TO Q19.

⇨ **Q18. Have you or someone else ever boiled camel milk before you started drinking it?**

◯ YES ◯ NO

Q19. Do you drink camel urine?

◯ NEVER
◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q19 = "NEVER" SKIP TO Q22.

⇨ **Q20. Thinking about the last time you drank camel urine; did you or someone else boil the camel urine before you started drinking it?**

◯ YES ◯ NO

IF Q20 = "YES" SKIP TO Q22.

⇨ **Q21. Have you or someone else ever boiled camel urine before you started drinking it?**

◯ YES ◯ NO

Q22. Do you apply camel urine topically onto your skin?

◯ NEVER
◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q22 = "NEVER" SKIP TO Q25.

⇨ **Q23. Have you ever put camel urine on your skin and it came into contact with any scratches, cuts, abrasions, or open wounds on your skin?**

◯ YES ◯ NO

⇨ **Q24. Have you ever put camel urine on your face?**

◯ YES ◯ NO

Q25. Do you eat camel meat?

◯ NEVER
◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q25 = "NEVER" SKIP TO Q28.

⇨ **Q26. Thinking about the last time you ate camel meat; was it uncooked/raw?**

◯ YES ◯ NO

IF Q26 = "YES" SKIP TO Q28.

⇨ **Q27. Have you ever consumed uncooked/raw camel meat?**

◯ YES ◯ NO

Q28. Have you ever been inside an area where camels are raised, held, quarantined, slaughtered, or butchered?

◯ YES ◯ NO

IF Q28 = "NO" SKIP TO Q30.

⇨ **Q29. How often are you inside an area where camels are raised, held, quarantined, slaughtered, or butchered?**

◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q30. Have you ever touched an adult camel with your hands?

◯ YES ◯ NO

IF Q30 = "NO" SKIP TO Q32.

⇨ **Q31. How often do you touch an adult camel with your hands?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q32. Have you ever touched a camel calf (baby or young camel) with your hands?

◯ YES ◯ NO

IF Q32 = "NO" SKIP TO Q34.

⇨ **Q33. How often do you touch a camel calf (baby or young camel) with your hands?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q34. Have you ever kissed a camel on its face?

◯ YES ◯ NO

IF Q34 = "NO" SKIP TO Q36.

⇨ **Q35. How often do you kiss a camel on its face?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q36. Have you ever milked a camel?

◯ YES ◯ NO

IF Q36 = "NO" SKIP TO Q38.

⇨ **Q37. How often do you milk a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q38. Have you ever slaughtered or butchered a camel?

◯ YES ◯ NO

IF Q38 = "NO" SKIP TO Q40.

⇨ **Q39. How often do you slaughter or butcher a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q40. Have you ever touched a camel's blood?

◯ YES ◯ NO

IF Q40 = "NO" SKIP TO Q42.

⇨ **Q41. How often do you touch a camel's blood?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q42. Has a camel ever sneezed or spit on you?

◯ YES ◯ NO

IF Q42 = "NO" SKIP TO Q44.

⇨ **Q43. How often does a camel sneeze or spit on you?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q44. Have you ever cleaned a pen, holding area, stable, farm grounds, living area, or quarantine for camels?

◯ YES ◯ NO

IF Q44 = "NO" SKIP TO Q47.

⇨ **Q45. How often do you clean a pen, holding area, stable, farm grounds, living area, or quarantine for camels?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

⇨ **Q46. Thinking about the last time you were cleaning a pen, holding area, stable, farm grounds, living area, or quarantine for camels, were camels physically present during your work?**

◯ YES ◯ NO

Q47. Have you ever been bitten or scratched by a camel?

◯ YES ◯ NO

IF Q47 = "NO" SKIP TO Q49.

⇨ **Q48. How often are you bit or scratched by a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q49. Have you ever been within 1 meter of a camel that has nasal discharge? *Interviewer should show an image of nasal discharge in a camel and point to someone or something approximately 1 meter away from the participant to indicate the distance.*

◯ YES ◯ NO

IF Q49 = "NO" SKIP TO Q51.

⇨ **Q50. How often are you within 1 meter of a camel that has nasal discharge?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q51. Have you ever stepped on, sat on, or touched a surface where fresh camel feces are frequently present?

◯ YES ◯ NO

IF Q51 = "NO" SKIP TO Q53.

⇨ **Q52. How often do you step on, sit on, or touch a surface where fresh camel feces are frequently present?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q53. Have you ever stepped on, sat on, or touched a surface where fresh camel urine is frequently present?

◯ YES ◯ NO

IF Q53 = "NO" SKIP TO Q55.

⇨ **Q54. How often do you step on, sit on, or touch a surface where fresh camel urine is frequently present?**

○ ONCE A DAY OR MORE
○ ONCE A WEEK OR MORE
○ ONCE A MONTH OR MORE
○ ONCE A YEAR OR MORE
○ LESS THAN ONCE A YEAR

Q55. Have you ever stepped on, sat on, or touched a surface where fresh camel blood is frequently present?

○ YES ○ NO

IF Q55 = "NO" SKIP TO Q57.

⇨ **Q56. How often do you step on, sit on, or touch a surface where fresh camel blood is frequently present?**

○ ONCE A DAY OR MORE
○ ONCE A WEEK OR MORE
○ ONCE A MONTH OR MORE
○ ONCE A YEAR OR MORE
○ LESS THAN ONCE A YEAR

Q57. Have you ever been in an area where <u>camel calves (babies and young camels)</u> are raised, kept, or present?

○ YES ○ NO

INTERVIEWER SCRIPT
Please listen to the following claims and state whether you agree, disagree, or neither.

Q58. Camels <u>cannot</u> cause me to get sick.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

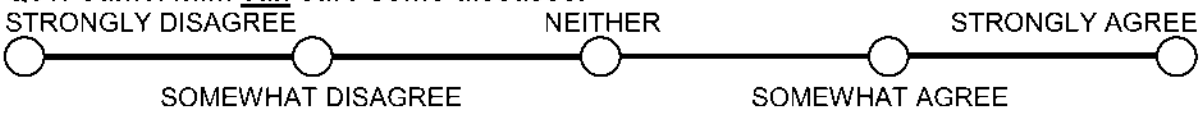
Q59. After touching a camel, wiping my hands with a towel or cloth is enough to fully clean my hands.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

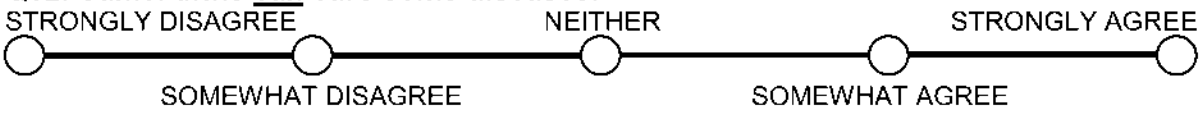
Q60. After touching a camel, it is important to me to wash my hands with soap and water before coming home to my family.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

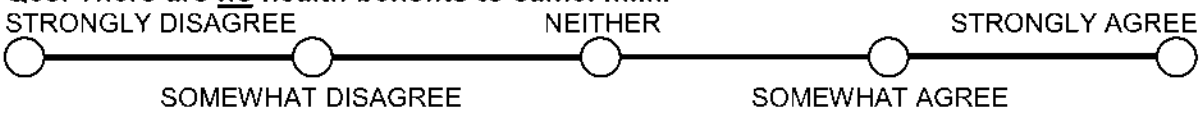
Q61. Camel milk <u>can</u> cure some diseases.



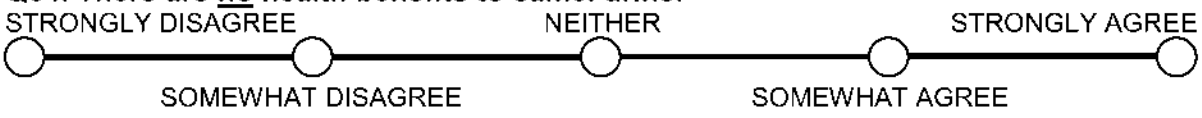
Q62. Camel urine <u>can</u> cure some diseases.



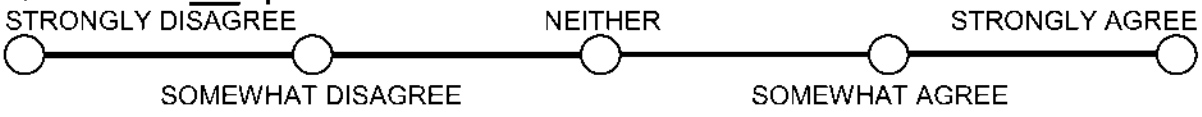
Q63. There are <u>no</u> health benefits to camel milk.



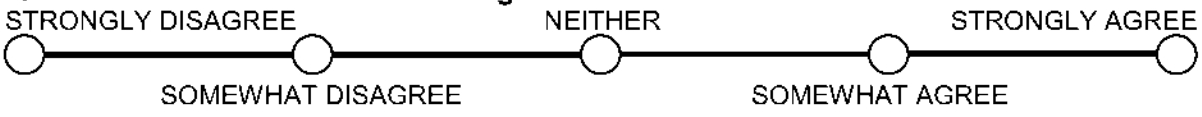
Q64. There are <u>no</u> health benefits to camel urine.



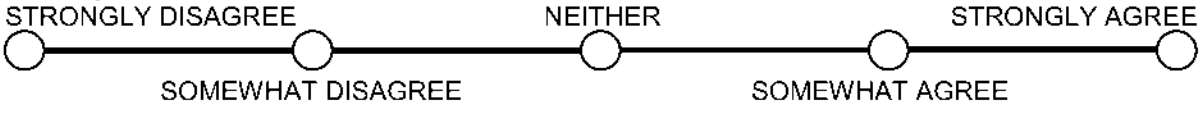
Q65. Camels <u>can</u> spread diseases to humans.



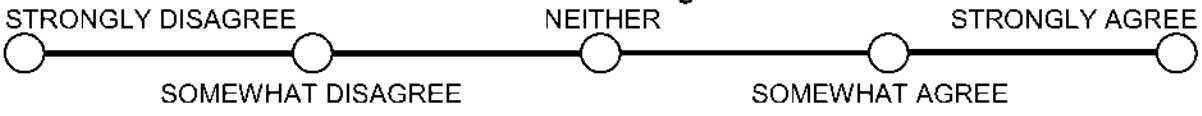
Q66. I believe someone I know has gotten sick from a camel.



Q67. I prefer the taste of raw/non-boiled camel milk over boiled camel milk.

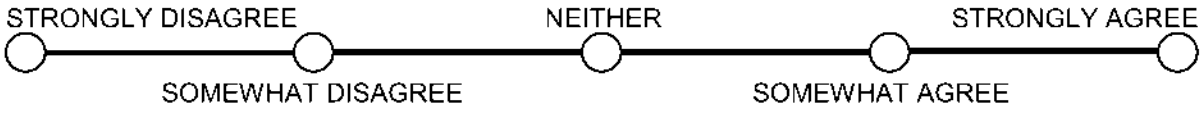


Q68. Camel milk should be boiled before drinking it.

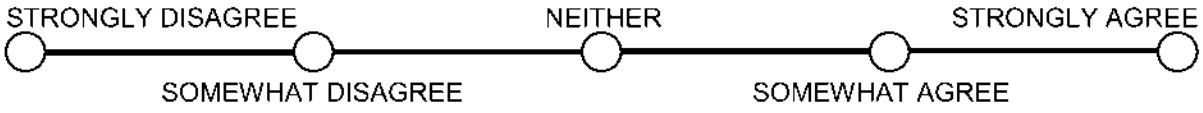


Q69. I believe someone I know has gotten sick from drinking raw/non-boiled camel milk, and would not have if it had been boiled first.

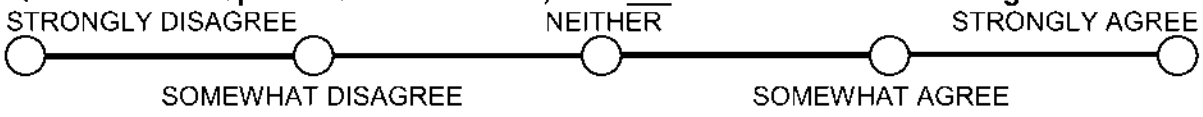
Q70. I believe someone I know has gotten sick from eating raw/uncooked camel meat, and would not have if it had been cooked.



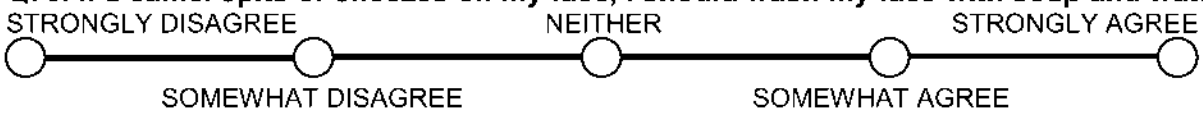
Q71. If I am cooking camel meat, there is no need to clean any surfaces that have come in contact with raw/uncooked camel meat.



Q72. If a camel spits or sneezes on me, I am not worried about becoming sick.



Q73. If a camel spits or sneezes on my face, I should wash my face with soap and water.



Q74. Do any of your jobs or livelihoods involve the ownership, buying, selling, trading, farming, management, care, or production of camels, camel meat, camel milk, camel urine, camel hair, or any other camel product?

○ YES ○ NO

⇨ IF Q74 = "YES" COMPLETE THE CAMEL WORK MODULE.

X

For animal subjects research, our protocols will align with PREDICT protocols, with which our in-country teams have been complying for three years. These protocols are listed below and, as they are very extensive, a link to access them is provided. They will be modified to reference the specifics of this project's IACUC (as opposed to PREDICT's IACUC):

- 5.2.11 Livestock Sampling Methods (see next page)

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "Field Sampling Guides."

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Section 5.2.11 Livestock Sampling Methods: Cattle, Sheep, Goats, Camels, and Swine

Prepared by
Marcela Uhart, University of California, Davis
Christopher Kilonzo, University of California, Davis
Kali Holder, Smithsonian
Jonathan Epstein, EcoHealth Alliance
and the PREDICT One Health Consortium

Objectives: To safely collect biological samples from livestock.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

The authors assert that animal capture and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Livestock Sampling Methods.

Table of Contents: Livestock Sampling Methods: Cattle, Sheep, Goats, Camels, and Swine

Section 5.2.11.a. Brief Overview of PPE

Minimum PPE Required for Livestock Sampling

The minimum PPE for livestock (including camels, cattle, sheep, goats, and swine) sampling includes:

1. Dedicated clothing
2. Nitrile (recommended) exam gloves
3. Safety glasses or other eye protection

(See the PREDICT ***Biosafety and PPE Guide (Section 4.1)*** for detailed instructions regarding PPE Use)

Standard disinfection procedures for equipment and clothing should be followed when moving between animal enclosures or properties.

Section 5.2.11.b. Livestock Handling and Welfare

Performance standards during handling include careful, considerate, respectful, calm, human interactions with animals in as positive a manner as is possible. Animals handled in a respectful manner will be calmer and easier to handle than animals handled in a rough or disrespectful manner. PREDICT field staff should be familiar with the correct techniques and the anatomy of each livestock species before attempting sampling procedures. At all times, observe animals for signs of excessive distress. If animals are unwell, stop all procedures, provide adequate support care, and release upon recovery.

While most veterinarians are familiar with handling livestock, we recommend that PREDICT staff visit the following guidelines as a refresher.
http://www.dardni.gov.uk/safe_cattle_handling_guidance.pdf

For more information on Animal Handling and Transport, see:
http://www.fass.org/docs/agguide3rd/Chapter05.pdf

For more information on welfare considerations for cattle handling, see:
http://www.animalwelfarestandards.net.au/files/2011/02/Cattle-Standards-and-Guidelines-for-Endorsement-May-0807141.pdf (Section 5, pages 13-16) and
Beef cows: **http://www.fass.org/docs/agguide3rd/Chapter06.pdf**
Dairy cows: **http://www.fass.org/docs/agguide3rd/Chapter07.pdf**

For more information on welfare considerations for sheep handling, see:
http://www.animalwelfarestandards.net.au/files/2011/02/Sheep-Standards-and-Guidelines-for-Endorsement-May-2014-080714.pdf (Section 5, pages 14 and 15) and
http://www.fass.org/docs/agguide3rd/Chapter10.pdf

For more information on welfare considerations for blood collection from cattle, see:
http://www.dpi.nsw.gov.au/agriculture/livestock/animal-welfare/general/livestock/sop/cattle/blood-collection

For more information on welfare considerations for swine handling, see:
http://www.fass.org/docs/agguide3rd/Chapter11.pdf

For more information on welfare considerations for camels handling, see:
http://www.publish.csiro.au/Books/download.cfm?ID=5204

Section 5.2.11.c. Sample Data Collection

Introductions and informed consent
Upon arriving to a household or farm, introduce yourselves (team members, purpose of the visit) to the acting head of household responsible for the livestock. Explain the purpose of the study, allow time for questions, and clarify any issues that may arise. If local regulations require it, obtain informed consent per project guidelines and protocols.

Animal Handling and Sampling Procedures
Note: For all food animals, manual restraint will be used. If drugs are used for sedation in a food animal, that animal will not be allowed to return the human food chain unless it is specifically labeled for use in that species and withdrawal periods are observed

The following basic set of samples should be collected from each animal where possible (If only one sample can be collected, then place into VTM):

1. **Two nasal swabs** - one in 500 µL VTM and one in 500 µL Trizol
2. **Two fecal samples** - one with max of 500 µL/0.5cc feces in 500 µL VTM and one with max of 500 µL/0.5cc feces in 1 mL Trizol
   Or
   Two rectal swabs - one in 500 µL VTM and one in 500 µL Trizol
3. **Two whole blood samples** - one with max of 500 µL of whole blood in 500 µL VTM and one with max of 500 µL of whole blood in 500 µL Trizol
4. **Two serum samples** - 2 x 1.0 ml aliquots frozen without media
5. **Two urogenital swabs or urine samples** - one with max of 500 µL of urine in 500 µL VTM and one with max of 500 µL of urine in 500 µL Trizol

Freeze all samples (except tissue in formalin) in liquid nitrogen immediately in the field and transfer to -80°C freezer once back in the lab.

If there is no **short-term** access (i.e. within 24 hours) to cold chain such as in an emergency situation, then samples can be collected in 500 µL of RNAlater instead of Trizol and VTM. Storage times and temperatures for samples in RNAlater are as follows:

- 1 day at 37 °C (i.e. ambient temp)
- 1 week in the refrigerator
- Within one week freeze at -80 °C for storage until analysis

Collecting Nasal Swabs

Using sterile, polyester-tipped swabs with a plastic shaft, rub the swab tip gently but thoroughly against the walls of the animal's nares, about 1-2" from the opening, saturating the swab with mucus. **Place 1 swab in a cryovial filled with 500 µl of VTM and the other swab into 500 µL of Trizol in another cryovial**. Mix each tube well. Store both cryovials in a liquid nitrogen dry shipper or dewar & transfer to -80˚C freezer when possible.

Bleeding Collection Techniques

1. Cattle

Blood can be collected from the jugular vein in cattle of all ages or from the tail (coccygeal) vein of older cattle.

A variety of collection devices may be used - vacutainers, bleeding tubes, syringe and needle. Restraint should ensure quick, easy and safe collection of the sample causing minimal distress. This may involve use of a bail, race, or crush for tail bleeding. For jugular bleeding the animal may require minimal restraint (e.g. halter) or may need to be restrained in a crush with head bail and the employment of a halter or nose grips. Use of nose grips should be avoided wherever possible.

Operators should use gloves and disinfect or replace them between animals to prevent the transmission of blood-borne diseases. Equipment such as vacutainer holders should also be cleaned between animals. An antiseptic must be applied to clean skin surface prior to venipuncture.

For a visual guide see the following online tutorials:

Cattle
https://www.youtube.com/watch?v=IuNbsTMrIuI (tail and jugular)
https://www.youtube.com/watch?v=ZEsHMwKFbKg (tail)
https://www.youtube.com/watch?v=812CskWCqGQ (jugular)

Procedure for Jugular Venipuncture Using Vacutainer Needle and Tubes:

1. Identify and georeference the study site and document the signalment of the animal on the data collection sheet.
2. Before sample collection, ensure that the animal is effectively and humanely restrained to avoid injury to the animal and/or study personnel.

3. Using the halter, position the animal's head so that it is slightly elevated and drawn to the side opposite the jugular vein to be sampled.
4. Disinfect venipuncture area with alcohol
5. Occlude the vein by applying digital pressure in the jugular groove located in the lower neck.
6. Place a vacutainer needle attached to a vacutainer holder into the distended jugular vein at a 45° angle cranial to the jugular groove.
7. Once needle is positioned in the vein, insert a vacutainer into the needle to collect the blood.
8. When the desired volume has been collected (5 ml minimum suggested) remove the occluding pressure from the vein.
9. Detach the tube from the needle and withdraw the needle from the jugular vein.
10. You can collect more than 1 tube by repeating steps 7 and 8.
11. Label the vacutainer tubes with the sample ID.

Procedure for Jugular and Coccygeal Venipuncture Using Syringe and Needle

Jugular bleeding

1. Restrain cow with the head elevated and the jugular groove exposed.
2. Raise the jugular vein by placing pressure at the base of the jugular groove.
3. Pass the needle through the skin and into the vein by a firm thrust directed at an angle of 20° to the skin surface.
4. Withdraw the blood sample.

Tail Bleeding

1. Restraint should prevent the cow from moving away during the procedure.
2. Raise the tail vertically with one hand until it is horizontal with the ground.
3. Approximately 150 mm from the base of the tail, locate the groove lying in the ventral midline of the tail.
4. Midway along the body of a coccygeal vertebra, insert the needle perpendicularly to the surface of the skin to a depth of a few millimeters.
5. Withdraw blood sample.
6. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

Once blood is collected, place the needle into a sharps container. Open red-top and purple top vacutainer tubes. Place approximately 2.5cc in each tube, then discard the syringe into a biohazard container. Invert each tube several times to mix.

2. Sheep/Goats

Blood should be collected from the jugular vein. The procedures for blood collection are identical to those described for cattle, with the exception of the amount of restraint needed and the possibility of shearing the bleeding area on the neck for easier viewing of the vein and minimizing the chance of introducing dirt or bacteria into the vein with the needle.

In sheep and goats, blood sampling can be done with assistance or alone. If you are not proficient at drawing blood alone, work with an assistant. The assistant should restrain the sheep/goat's body and turn the head to the side, at a 30-degree angle, by holding the animal under its jaw to allow for easy access to the jugular vein.

Restraining a sheep or goat without assistance is better for those who have become proficient at drawing blood. The handler should straddle the sheep/goat, place his or her knees behind the animal's shoulders, and back the sheep/goat into a corner or against a wall to help control their hindquarters. The sheep/goat's head should be turned opposite to the side of collection, once again at a 30-degree angle. Restraint of the head is accomplished by using the elbow and the upper arm to keep it held off to the side. This leaves both hands available for the blood collection.

The easiest way to locate the vein is to draw an imaginary line from the middle of the sheep/goat's eye down the side of the neck. The vein can be located by applying pressure with the thumb or fingers in the groove on either side of the trachea. The pressure will cause the vein to pop up and be easy to feel or see if the area has been shaved. Proceed as with cattle, using a vacutainer collection system or syringe and needle.

For a visual guide see the following online tutorials:

Sheep/goats (small ruminants) **https://www.youtube.com/watch?v=47tlmqXX3eE**

Blood sample processing and storage:

Whole Blood

- Collect whole blood into 1 lavender top tube containing EDTA, and allow another tube to clot for collection of serum.
- Add up to 500 µL of whole blood (from EDTA tube) directly into 2 vials, one containing 500 µL Trizol and one containing 500 µL VTM (= maximum final ratio of 1:1) and mix each vial well.

Serum

- After clotting is complete, use a plastic pipette to take 1 ml of serum and transfer into 2 cryovial tubes, 0.5 ml each.
- If a centrifuge is available, centrifuge samples for 15 minutes and then collect 1 ml serum and transfer into 2 cryovial tubes, 0.5 ml each.
- Label the cryovial tubes with the same label information used on vacutainer tube.
- You can harvest additional serum for serum bank as appropriate.
- Freeze all samples in liquid nitrogen immediately in the field and transfer to -80°C freezer once back in the lab.

3. Camels

Because of the risk of MERS CoV exposure, sample collectors should wear gloves, a respirator, and eye protection when handling camels.

Blood can be collected from the jugular vein in camels of all ages, though it is recommended that this be undertaken on animals while they are in sternal recumbency (kush position), well-restrained, or sedated. The lateral thoracic vein or caudal epigastric ("milk") vein may be used but should only be targeted in animals where physical or chemical restraint prevents kicking.

A vacutainer needle (18G or 19G) with purple top (EDTA) tubes and red-top (with serum clot activator) tubes may be used, or a 5cc syringe and 18G or 19G needle. Restraint should ensure quick, easy and safe collection of the sample causing minimal distress.

Equipment such as vacutainer holders should be cleaned between animals.

Procedure for Jugular Venipuncture Using Vacutainer Needle and Tubes

1. Identify and georeference the study site and document the signalment of the animal on the data collection sheet.
2. Before sample collection, ensure that the animal is effectively and humanely restrained to avoid injury to the animal and/or study personnel.
3. Using the halter, elevate the animal's head and draw it to the side opposite the jugular vein to be sampled.
4. Disinfect venipuncture area with alcohol
5. Occlude the vein by applying digital pressure in the jugular groove located in the lower neck. Alternatively, a rolled towel affixed with a rope over the withers can be applied at the same level to act as a temporary incomplete tourniquet.
6. Place a vacutainer needle, attached to a vacutainer holder, into the distended jugular vein at a 45° angle cranial to the jugular groove.
7. Once the needle is positioned in the vein, insert a vacutainer into the needle and collect the blood.
8. When the desired volume has been collected (5 ml minimum suggested), remove the occluding pressure.
9. Detach the tube from the needle.
10. Detach the needle from the jugular vein and apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.
11. If more than one tube of blood is required, repeat steps 7 through 9 with occluding pressure.
12. Label the vacutainer tubes with sample ID.

Note: If vacutainer needles are unavailable, a 5cc syringe and 18G or 19G needle can be used. Once blood is collected, place the needle into a sharps container. Open red-top and purple top vacutainer tubes. Place approximately 2.5cc in each tube, then discard the syringe into a biohazard container. Invert each tube several times to mix.

Whole blood can be aliquoted into cryotubes with VTM and Trizol using a pipette gun. Serum tubes can either be centrifuged (if available) or placed vertically in a cooler with ice bricks and allowed to stand undisturbed overnight (~12 hours) for clean serum separation. Serum can then be aliquoted into cryotubes.

Procedure for Jugular Venipuncture Using Syringe and Needle

Jugular bleeding

1. Restrain camel with the head elevated and the jugular groove exposed.
2. Disinfect venipuncture area with alcohol
3. Raise the jugular vein by pressure at the base of the jugular groove.
4. Pass the needle through the skin and into the vein by a firm thrust directed an angle of 20° to the skin surface.
5. Withdraw blood sample.
6. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

Lateral Thoracic/Caudal Epigastric Vein Bleeding

1. Restraint should prevent the camel from moving away or kicking during the procedure.
2. Identify the lateral thoracic vein, caudal to the point of the elbow's olecranon process.
3. Pass the needle through the skin and into the vein by a firm thrust directed an angle of 20° to the skin surface.
4. Withdraw blood sample.
5. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

4. Swine

All personnel handling or sampling pigs should wear appropriate PPE and practice appropriate biosafety practices to avoid spreading infection from one animal to another and from one herd, farm or property to another. This includes wearing dedicated clothing (e.g. coveralls and rubber boots) that can be removed and disinfected once work at a site has been completed. Recommended PPE includes nitrile gloves, a respirator and safety glasses.

Restraint: Manual restraint is recommended, without the use of anesthesia. Pigs to be sampled should be constrained to a separate pen, if possible. The use of a snout snare (see appendix) by the animal restrainer is recommended for pigs over 20 kg, but should only be used by experienced personnel and for short term restraint to avoid injury to the pig's snout. Pigs will be restrained for a maximum of three minutes and then released. If blood collection is unsuccessful, then the pig will be allowed to calm down for five minutes before a second attempt is made.

Blood can be collected from the external jugular vein, or the cranial vena cava, using a 1", 20G needle and a 5cc syringe. This technique requires the head to be restrained and elevated parallel to the ground, typically using a snout snare. In pigs weighing less than ~50 kg, blood can be collected further caudally (and more medially) in the jugular groove, nearer the manubrium from anastomose of internal and external jugular vein. For pigs weighing less than ~20 kg, a technician will manually restrain the pig on his lap, holding the forelegs in one hand, and the animal's head in the other. Then a max of 5.0 to 10 ml may be collected from the jugular vein. Venipuncture should only be performed by experienced personnel.

The marginal ear veins are the only veins that are easily visible on pigs of any size. Usually there are three prominent veins. The lateral or central vein is usually the largest of these. These veins may also be punctured for blood collection. An alternative venipuncture site is the caudal auricular ("marginal ear") vein, though this typically yields low (<1 mL) blood volumes. A smaller, 22G or 23G needle should be used for this vein.

See also http://oslovet.norecopa.no/teaching/pig/pigbleed/ for more details on blood collection from pigs.

Collecting Fecal Samples

Ensure the animal is properly restrained prior to sampling. Fresh fecal samples should be collected, preferably from the rectum. If freshly passed, feces can be collected off the ground. Only the top part of a freshly passed fecal pat should be collected using a disposable spoon or scooped up in a gloved hand, plastic bag or plastic vial.

For Collection from the Rectum in Cattle and Camels

- The operator places an obstetrical sleeve on one arm
- The arm is formed into a cone and the animal's tail held to one side with the opposite gloved hand.
- Gentle pressure is applied to the anal sphincter until penetration into the rectum is obtained.
- A fecal aliquot of sufficient size for the intended laboratory procedure is scooped with the sleeved hand and removed from the animal.
- The fecal sample is placed in a separate container or the obstetrical sleeve is inverted off the arm such that the fecal sample is trapped inside.

Small calves, sheep, goats, and swine: restrain manually. Gently pass a gloved, lubricated finger through the anus and massage the rectal wall to stimulate rectal evacuation. If feces are not produced, collect feces with finger.

Place two ~200 mg (pea size) samples of fresh feces into 2 vials, one containing 500 µL VTM (= maximum final ratio of 1:1) and one containing 1 mL Trizol (= maximum final ratio of 1:2). Homogenize by shaking. Freeze in dry shipper or dewar with liquid nitrogen and transfer to -80˚C freezer when possible.

If feces are not available, collect 2 rectal swabs- 1 in VTM and 1 in Trizol: Gently insert one sterile swab tip at a time into the animal's rectum. [Note: DO NOT USE TRIZOL AS A LUBRICANT – IT IS HIGHLY IRRITATING TO TISSUE.] Place 1 swab in a cryovial filled with 500 µL of VTM. Place the other swab into a tube with 500 µL of Trizol. Store in a dewar or dry shipper with liquid nitrogen dry shipper and transfer to -80˚C freezer when possible.

Collecting Urine/Urogenital Swabs

Many animals will urinate as a fear reaction while they are handled. Urine can be collected free catch in plastic vials. Add up to 500 µL of urine directly into 2 vials, one containing 500 µL VTM and one containing 500 µL Trizol (= maximum final ratio of 1:1) and mix each tube well. Store in dry shipper or dewar with liquid nitrogen and transfer to -80˚C freezer when possible.

If urine is not available, collect 2 urogenital swabs: 1 in VTM and 1 in Trizol. Place 1 swab in a cryovial filled with 500 µL of VTM. Place the other swab into a tube with 500 µL of Trizol. Store in a dewar or dry shipper with liquid nitrogen dry shipper and transfer to -80˚C freezer when possible.

Section 5.2.11.d. Sample Collection from Dead or Euthanized Livestock

PREDICT's primary approach to sample collection in livestock is to collect specimens from living animals. In the event that an animal has died of natural causes or been euthanized due to humane or veterinary care reasons, the guidelines below for necropsy sampling may be followed. If bodies are relatively whole and fairly fresh, then sample as described above. The *American Veterinary Medical Association guidelines (Section 8.5.2.)* in the PREDICT Operating Procedures ebook provides information on animal euthanasia that may be useful to PREDICT veterinarians called upon to euthanize an animal.

As discussed throughout this protocol, all animals should be considered potentially infectious for a wide variety of dangerous pathogens, and dead animals in particular should be sampled only following all safety measures, including proper PPE use, proper work station decontamination, and proper carcass disposal, as outlined here and in other PREDICT documents.

Though not required for PREDICT sampling, thorough necropsy procedures can be very beneficial and relevant for some animals (e.g., suspicious deaths). Time and skill permitting, when full necropsies are performed, following any Association of Zoos and Aquariums/AZA (or similar) necropsy protocol is recommended and most can be adjusted for application to livestock species. Necropsy protocols are also addressed in the Non-Human Primate Sampling protocol, Appendix V.: AAZV's Occupational Primate Disease Safety Guidelines for Zoological Institutions: Standardized Necropsy Report for Non-Human Primates Work Sheet (ebook Section 5.2.6j.); most of the information and worksheets in this document can be utilized for sampling of

livestock. (*Note that properly following extensive necropsy procedures and collecting and measuring all samples can require 4-6 hours for a single animal.*)

Duplicate blood samples are to be collected from each animal; one sample must be collected into Trizol and one into viral transport media (VTM). If only one sample can be collected, then place the sample into VTM.

Tissue specimens should be collected in triplicate. One specimen should be frozen in 500 µL VTM in a cryovial, one should be frozen in 1 mL Trizol in a cryovial, and one should be stored at room temperature in a small vial or jar in 10% buffered formalin at a volume of fixative 10 times the volume of the tissue (once fixed, the tissue may be transferred to a smaller volume for shipment).

Post-Mortem Blood Collection

From recently dead animals, it may be possible to collect whole blood (often clotted) from the right side of the heart where the largest volume of blood is available. Collect all available blood into an appropriate size container (typically one or more blood tubes). Allow the tubes to sit undisturbed for at least 30 minutes, and then centrifuge at high speed (2000 x G for 20 minutes). Transfer the serum (clear, yellow or red-tinged fluid at the top), preferably via pipetting, to appropriately labeled cryovials. Transfer the remaining blood clots to separate cryovials. Refrigerate or freeze both the serum and blood clots.

If a centrifuge is not available, allow the clots and cells to settle as much as possible, and then collect the serum and clots as described above. If the animal's death is recent enough that the blood has not yet clotted and a centrifuge is not available, invert the blood tubes after the blood has been collected to allow the clot to form on the rubber stopper. After the blood has clotted, turn the tube right side up and carefully remove the stopper with the adhered clot, thereby leaving a clean serum sample in the tube.

At a minimum, as many of the following blood samples as possible should be collected:

- 2 samples of 500 µL (**whole blood**) placed in 2 vials, one containing 500 µL **Trizol** and one containing 500 µL **VTM** (= maximum final ratio of 1:1). Mix each vial well.
- 2 or more aliquots (0.5 ml) of **separated serum**, frozen

Tissue Collection

Collect three, adjacent, approximately 200mg (pea-sized) samples of the following tissues:

- Adrenal
- Colon
- Heart
- Liver
- Lymph node
- Ovary
- Testes
- Cecum
- Duodenum
- Kidney
- Lung
- Spleen
- Pancreas
- Other, if required*

*It will usually require experience to identify abnormal tissues, but potentially recognizable gross lesions include masses, discolored areas, ulcerations, etc. Samples for histopathology (i.e., in formalin) should be collected at the abnormal margins to include both normal and abnormal sections in the same piece of tissue. Collection of any obvious internal parasites in ethanol is also recommended.

Section 5.2.11.e. References

Higgins, A. J., & Kock, R. A. (1984). A guide to the clinical examination, chemical restraint and medication of the camel. *The British Veterinary Journal*, *140*(5), 485–504.

Fowler, M. E. (2010). Chapter 4 Clinical Diagnosis: Examination and Procedures in *Medicine and Surgery of Camelids*. (3 edition). Ames, Iowa: Wiley-Blackwell.

http://www.dardni.gov.uk/safe_cattle_handling_guidance.pdf

http://www.fass.org/docs/agguide3rd/chapter05.pdf =

http://www.dpi.nsw.gov.au/agriculture/livestock/animal-welfare/general/livestock/sop/cattle/blood-collection

http://www.biotracking.com/goats/biopryn/use

Section 5.2.11.f. Appendix I. Dentition Age Determination for Cattle, Sheep, and Goats

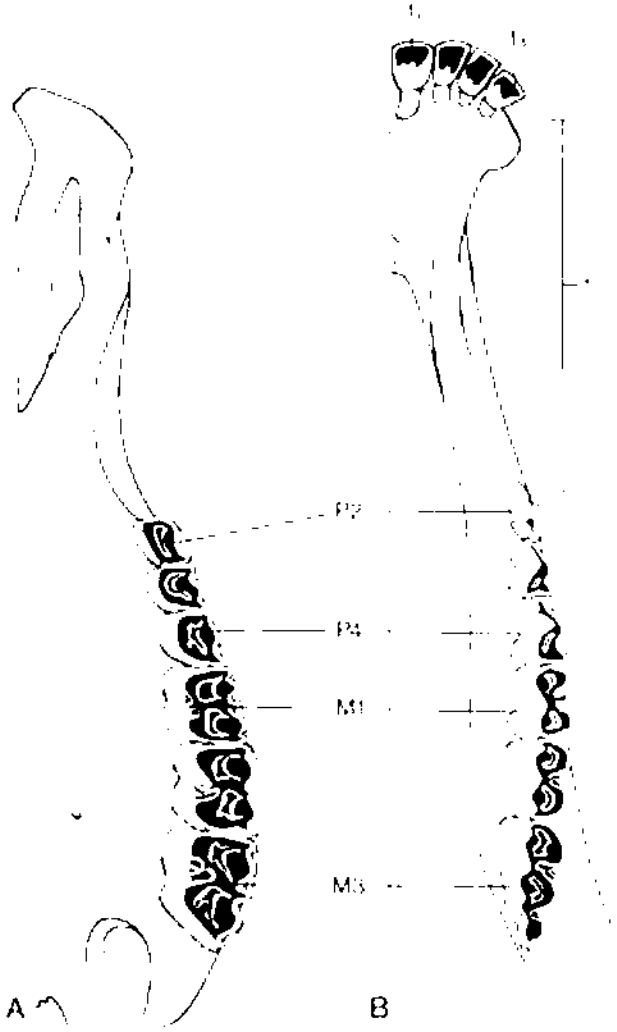

FIGURE 25–20. Left half of upper and right half of lower jaw of cattle. Notice the different shapes of the upper and lower cheek teeth and the large diastema (D).

Figure 1: From Dyce, Keith M., Wolfgang O. Sack, and Cornelis Johannes Gerardus Wensing. Textbook of Veterinary Anatomy. Elsevier Health Sciences, 2009.

Table 1: Eruption dates of the teeth of cattle

Teeth	Deciduous Teeth	Permanent Teeth
Incisor 1	Birth to 2 weeks of age	18 – 24 months
Incisor 2	Birth to 2 weeks of age	24 – 30 months
Incisor 3	Birth to 2 weeks of age	36 months
Incisor 4	Birth to 2 weeks of age	42 – 48 months
Premolar 2	Birth to 1 week	24 – 30 months
Premolar 3	Birth to 1 week	18 – 30 months
Premolar 4	Birth to 1 week	30 – 36 months
Molar 1		12 – 18 months
Molar 2		24 – 30 months
Molar 3		18 – 24 months

Table 2: Eruption dates of the teeth of sheep and goats.

Teeth	Deciduous Teeth	Permanent Teeth
Incisor 1	Birth to 1 weeks of age (at birth)	12 – 18 months
Incisor 2	Birth to 1 weeks of age (at birth)	18 – 24 months
Incisor 3	Birth to 1 weeks of age (at birth)	30 – 36 months
Incisor 4	1 to 3 weeks	36 – 48 months
Premolar 2	3 weeks	18 – 24 months
Premolar 3	3 weeks	18 – 24 months
Premolar 4	3 weeks	18 – 24 months
Molar 1	3 – 4 months	
Molar 2	8 – 10 months	
Molar 3	18 – 24 months	

Section 5.2.11.g. Appendix II. Snares

Figure 1: A commercial snout snare (left) and use of a modified snout snare, made from local materials, to restrain a pig during sampling in Bangladesh (right).

Section 5.2.11.h. Appendix III. Checklist for Supplies

General equipment and supplies

- ☐ Animal handling equipment – Halters and animal restraining ropes
- ☐ Data Collection forms
- ☐ Rubber stamp ink and pad
- ☐ GPS
- ☐ Camera
- ☐ Field Notebook
- ☐ Pen/Pencil
- ☐ Permanent markers
- ☐ Cryomarkers
- ☐ Protective clothing – Waterproof rubber boots, overalls, facemask, and nitrile gloves
- ☐ First aid kit
- ☐ Ice box containing ice packs (for short term storage and transport)
- ☐ Sharps bin
- ☐ Sturdy garbage bags
- ☐ Field centrifuge (portable 12vt)
- ☐ Liquid nitrogen dewar

Blood sample collection equipment and supplies

- ☐ EDTA vacutainer tubes – 9ml (lavender top)
- ☐ Serum separator vacutainer tubes – 9ml (red/gray top)
- ☐ Vacutainer needle holders
- ☐ Vacutainer needle: Cattle and Camels, 1½" 18 or 19 gauge; Sheep, Goats, and Swine, 1" 20G
- ☐ Syringes: 20, 10 and 5 ml
- ☐ Needles: Cattle and Camels, 1½" 18 or 19 gauge; Sheep, Goats, and Swine, 1" 20 guage for jugular or 22 or 23 gauge for auricular vein
- ☐ Alcohol (squirt bottle or vaporizer)
- ☐ Gauze
- ☐ Vacutainer tube rack
- ☐ Cryovial tubes
- ☐ Cryovial rack
- ☐ Centrifuge
- ☐ VTM
- ☐ Trizol

Fecal Sample Collection Equipment and Supplies

- ☐ Obstetrical Sleeve
- ☐ Disposable Spoons
- ☐ Plastic bags or vials
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Urine Sample Collection Equipment and Supplies

- ☐ Plastic vials
- ☐ Plastic pipettes
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Swab Collection Equipment and Supplies

- ☐ Plastic handle, polyester tip swabs
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Tissue Collection Equipment and Supplies (in case of animal necropsy)

- ☐ 21 Gauge needles for cardiocentesis
- ☐ 1 mL Syringe for cardiocentesis
- ☐ Scalpel and surgical blades
- ☐ Forceps
- ☐ Sharp and blunt tip scissors
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol
- ☐ Small Vials or Jars
- ☐ 10% Buffered Formalin

Section 5.2.11.i. Appendix IV. Additional Permit Requirements for Livestock Samples Imported into the United States

In addition to all other permits, livestock samples require special import permits from the USDA.

http://www.aphis.usda.gov/publications/plant_health/2012/fs_imp_food_ppq.pdf

http://www.aphis.usda.gov/wps/portal/aphis/resources/permits/!ut/p/a1/jZDLDoIwFES_hi0dKmJ1VyVCfUVjjNiNQYOVBKgpKL8vGjfG5-zuzTnJZlgkEZFFfElVXKW6iLPbLb2tKxilLVDBlgsPYjiftQeUOgi8Btg0wCDgoduZAHAZhfD7od_pTgHh_efjQzh--Wsin5HA4X7jLSezRTgExs4D-FbxDnzpMCJSZXp332PDi12LKSJNckhMYuyzad7HqjqVPQsW6rq2ldYqS-y9zu3YWHhnHXVZkegFJqd8FSGd52tW8ivrt9DV/?1dmy&urile=wcm%3apath%3a%2Faphis_content_library%2Fsa_our_focus%2Fsa_animal_health%2Fsa_import_into_us%2Fct_animal_imports_home

7. GUIDELINES FOR SAMPLE TRANSPORT

Sample transport from the human and animal field sites will follow established protocols from the PREDICT project, which JUST has been implementing for three years. We will adhere to these cold chain protocols except where necessary to modify to meet the project's specific requirements:

- 6.1 Implementing Cold Chain for Safe Sample Transport and Storage (see next page)

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "General Information."

Section 6.1. Implementing Cold Chain for Safe Sample Transport and Storage

Prepared by
David Wolking, University of California, Davis,
and the PREDICT One Health Consortium

Objective: To provide principles and general considerations for cold chain maintenance, the safe transport and storage of samples collected during PREDICT surveillance activities, and the safety of personnel.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Implementing Cold Chain for Safe Sample Transport and Storage.

Table of Contents: Implementing Cold Chain for Safe Sample Transport and Storage

Section 6.1.1. Introduction to Cold Chain

This guide focuses on implementing an efficient cold chain and sample transport/storage plan appropriate for PREDICT disease surveillance activities. The guidance provided is to ensure that all PREDICT materials arrive at their end laboratories in suitable condition for PREDICT diagnostics and pathogen testing. When you are familiar with the information in this Guide, take the PREDICT quiz on ***Implementing a Cold Chain for Safe Sample Transport (Section 8.4.14.)***.

A cold chain is a monitored temperature-controlled supply chain. The goal of the cold chain is to keep a sample or material within a certain temperature range during all stages of delivery, processing and storage (Figure 1). Cold chains are widely used to ensure the viability of products in the pharmaceutical and agricultural sectors, and are critical components of vaccination programs and bio-medical surveillance activities.

Many biological samples deteriorate when exposed to heat, sunlight, or fluorescent light. When transporting and storing such biological substances, it is imperative that field and laboratory teams control environmental conditions, ensuring that exposure to potentially damaging environmental factors is minimized.

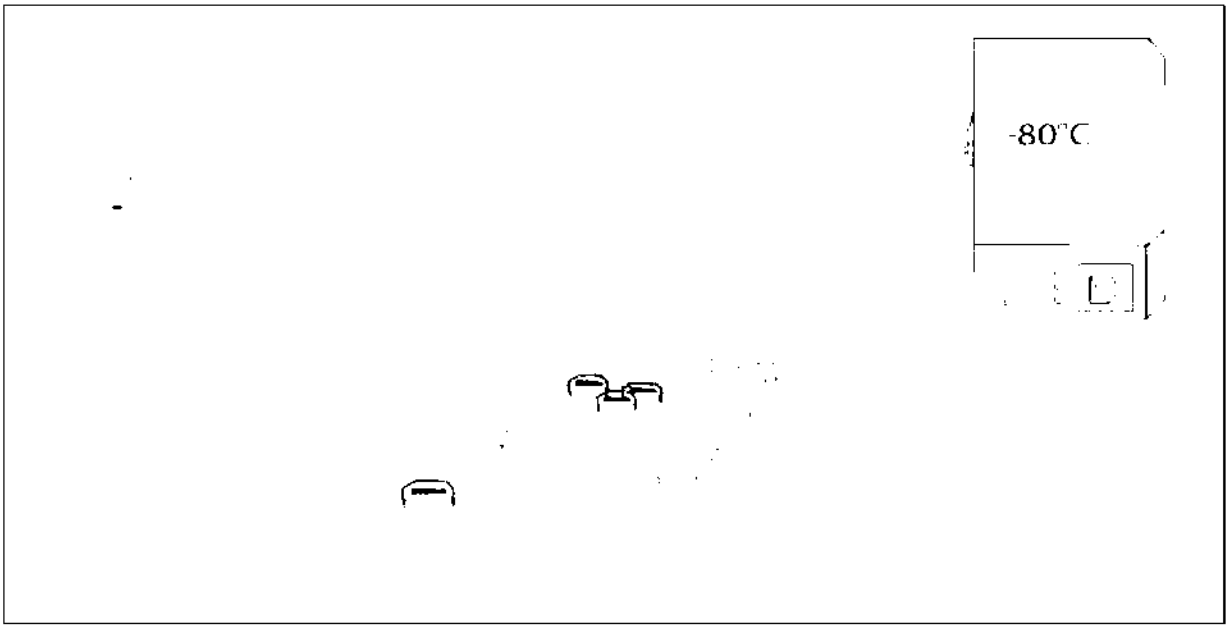

Figure 1: Illustration of a typical cold chain from field to lab storage for PREDICT biological samples. Field teams sample an animal and place specimens in liquid nitrogen dewar for storage. The dewar with specimens is transported in the back of a project vehicle to long-term storage at a PREDICT laboratory or field station, inventoried, and archived until testing in an ultra-low temperature freezer (<-80°C).

Freezing is the simplest way to ensure that the biological samples remain viable for laboratory analysis. The cold chain for PREDICT samples can be maintained through the use of ice packs, coolers and dry ice (for a very brief period immediately following collection), liquid nitrogen (LN2) containers and freezers, and the use of ultra-low temperature (-80°C and colder) freezers. It is recommended that PREDICT samples be placed in LN2 or ultra-low temperature freezers as soon as possible to optimize sample viability for diagnostics and pathogen testing.

Repeated exposure to heat leads to a cumulative and irreversible loss of sample viability and may render a sample useless for laboratory analysis.

PREDICT Sample Cold Chain Requirements: All biological samples from PREDICT surveillance activities should be stored and transported at temperatures colder than -80ºC suitable for the preservation of targeted PREDICT pathogens and viral detection.

Section 6.1.2. Implementing the Cold Chain

This section introduces recommended steps for cold chain planning and implementation.

Section 6.1.2a. Planning

The first step in implementing the cold chain is planning. Your team must identify the cold storage needs for your sampling activities, then identify and procure all necessary materials and resources. In addition, it is critical to train your team to understand the logistics of the cold chain, how to monitor cold chain temperature, and how to maintain system records.

Considerations for Cold Chain Planning:

1. What is your surveillance plan and what type of cold chain is appropriate for that plan? What types of samples are you collecting? What are the temperature requirements for safely storing these samples?
2. Assess local context and conditions. Do you have access to long-term sample storage facilities? Are your sampling activities located in remote rural locations several days or weeks from the project infrastructure or laboratory?
3. Determine where the cold chain ends. If your field team delivers samples to a laboratory with an ultra low temperature freezer, then initiating your cold chain may require simply extending it from laboratory to sampling site through the use of LN2 dry-shippers or dewars. If you are developing a cold chain without any pre-existing infrastructure, mapping out an appropriate cold chain from sample collection to endpoint is essential (Figure 2).
4. Determine the maximum amount of time samples will be located outside of long-term cold storage. If your field activities are 5 days away from long-term storage, then you will need a minimum of 5 days mobile cold storage in LN2. If you plan to export samples, how long will it take to ship from origin to destination?
5. Determine the minimum amount of time samples will stay in long-term storage. Planning for long-term storage requires assessing the space necessities of your cold chain. Are you

maintaining a sample bank or archive? If so, you will need to plan for sufficient storage space for the life of the project to preserve sample viability.

6. Establish procedures for monitoring the cold chain and tracking the samples moving through the cold chain. Confirm all team members have been trained in cold chain maintenance and record keeping. Prepare forms for data logging and recording. Prepare a schedule for re-filling LN2 containers and contingency plans for equipment failure.

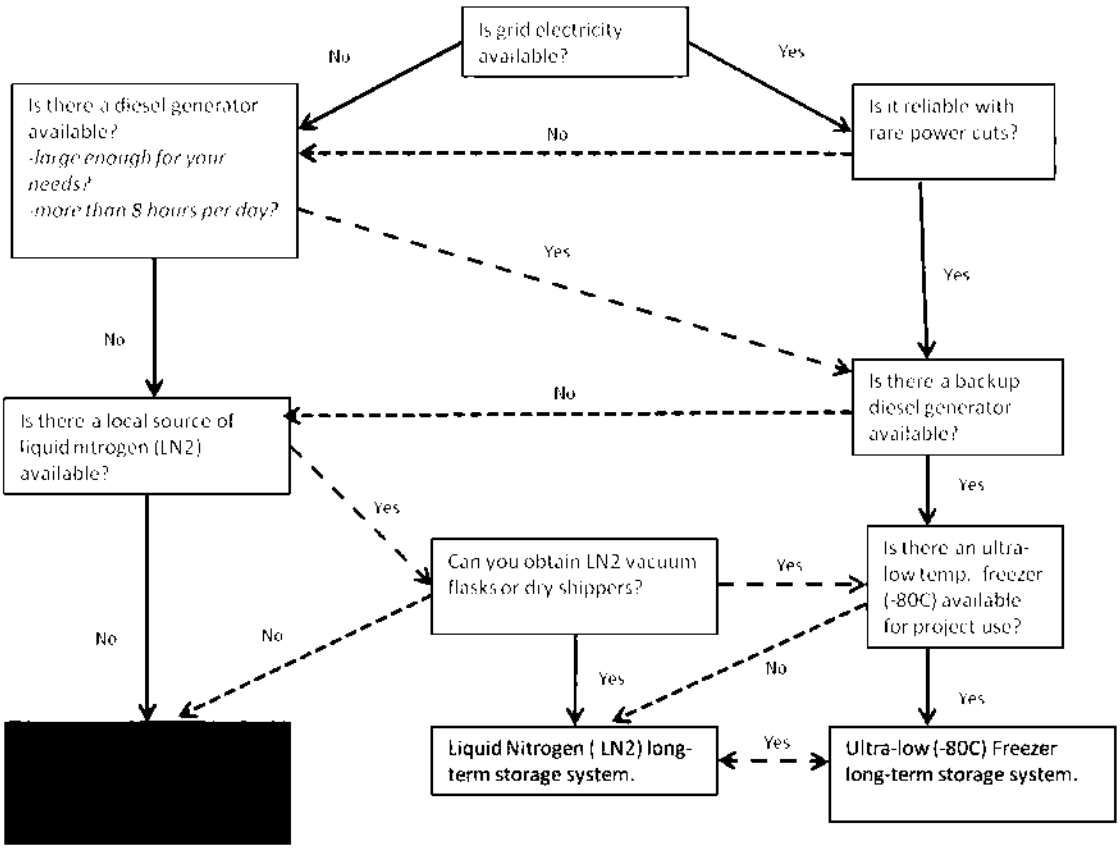

Figure 2: A decision tree for cold chain planning. Based on United Nations World Food Program Logistics Cluster "Logistics Operational Guide".

Developing a Cold Chain System

To develop and maintain a cold chain, a series of simple and routine processes must be established. These processes should be designed to function efficiently in each team's environmental and local conditions, and should be easy to maintain with available materials and resources.

1. Assess the opportunities and constraints to developing a cold chain in your area. These may include:
    a. Access to a pre-existing cold chain
    b. Access to LN2, and LN2 transport and storage supplies
    c. Access to an ultra-low temperature (sub -80°C) freezer available for use
        i. If freezer available, does it have a backup generator and alarm system?

2. Identify the appropriate materials and resources needed to implement and maintain the cold chain. Required materials and resources may include:
    a. Personal Protective Equipment (PPE) for working with LN2 and -80ºC freezers
    b. Coolers
    c. Ice/gel freezer packs
    d. Liquid Nitrogen (LN2) dewars and/or LN2 vapor-phase dry shippers (see distinctions below in Table 2)
    e. Source of LN2
    f. Large capacity LN2 storage dewars or ultra-low temperature (<-80°C) freezers for longer-term sample storage
    g. Temperature gauges, thermometers, data loggers (as needed), alarm systems, and an alert network for staff when facilities are unoccupied
    h. Appropriate sample storage containers and racks for sample organization
3. Identify local suppliers or other sources for procurement of materials and resources. (Note: Carefully assess the reliability/sustainability, and costs of any suppliers to assure procurement of reliable supplies and ability to service equipment.)
4. Establish a written protocol for monitoring the cold chain and stored samples. The protocol should cover:
    a. Temperature regulation and record
    b. Sample storage and tracking system
    c. Equipment maintenance schedules
    d. Response procedures in event of container/freezer failure or power outage
    e. Training programs to ensure continued and safe operation of cold chain system
    f. Annual review of cold chain operation and sample storage procedures

Cold Chain Materials and Resources

A cold chain can consist of any combination of materials and resources that serve to maintain samples at a desired temperature. **For all PREDICT samples, that temperature is -80°C or lower.** This temperature range requires the use of specialized cooling technologies and specially designed freezers. Gas-based coolants (LN2) do not require electricity, and can be deployed to remote and rural areas. In contrast, ultra low temperature (< -80°C) commercial freezers are dependent upon an electrical grid and emergency generators in the event of blackouts or grid failure.

Safety Considerations for Coolants

Working with cold chain coolants can be dangerous if appropriate precautions are not taken. The recommended PREDICT cold chain requires samples to be stored in temperatures well below freezing. Exposure to these temperatures can cause severe burns and damage to living tissue. There are three coolants commonly used in implementing a cold chain: 1) ice/gel packs, 2) dry ice, and 3) liquid nitrogen (LN2). Dry ice and LN2 give off gases that can cause asphyxiation and should only be handled by trained personnel in ventilated areas. In addition, dry ice and LN2 containers must be able to vent evaporated gas to avoid the risk of explosion. Characteristics and safety considerations for working with cold chain coolants are listed in Table

1. For more information on human safety when working with PREDICT field and laboratory activities, please review the *PREDICT guide to* ***Biosafety and PPE Use (Section 4.)***.

Table 1: Characteristics and safety considerations for PREDICT cold chain coolants.

Coolant	Characteristics	Use and Maintenance	Safety Considerations
Ice Packs	Ice packs are water filled packs that obtain the temperature of a standard freezer (approx.-18°C). **Ice packs DO NOT achieve temperatures sufficient for the preservation of PREDICT biological samples.**	Ice packs must be kept in a freezer for 12-24 hours to achieve maximum coldness. Keep at a temperature colder than the freezing point of the ice pack, to ensure longer cold life.	None (water-based product). Do not chill ice packs used for samples in refrigerators or freezers used for food and beverages.
Gel Packs	Gel packs consist of a liquid blend of chemicals that depress the melting point of a cold pack allowing the gel pack to remain colder than 0°C for longer time intervals than an ice pack. **Gel packs DO NOT achieve temperatures sufficient for the preservation of PREDICT biological samples.**	Before purchase, request documentation from the manufacturer to validate manufacturer claims on the product's cold life, and to obtain instructions on appropriate use of the product, including packaging a cooler with biological samples and the gel packs. Gel packs take at least 24 hours to reach their lowest temperature and can take even longer if chilled in a domestic refrigerator.	Though most gel packs are non-toxic, be careful to not ingest gel from ruptured gel packs. Consult manufacturer guidelines for product use on safety.
Dry Ice	Dry ice is the solid form of carbon dioxide (CO_2), and is approximately -78.5ºC. In ambient conditions, dry ice is unstable and evaporates quickly. Therefore, samples packed in dry ice should be transferred to a <-80º container within 24 hours. **Dry ice is recommended as a SHORT-TERM COOLANT ONLY**, to be used for transporting samples from the field to more reliable temperature controlled storage containers.	Dry ice is easily manufactured, often as a byproduct of other processes, and is widely used in the food industry for preservation. Dry ice can frequently be sourced from breweries, importers of frozen products like ice cream, and meat processing facilities. Any specimens transported on dry ice must be placed in specially insulated containers capable of venting gaseous CO_2. Note: sealing seams of containers like Styrofoam cold boxes prevents ventilation of the gas and can lead to unsafe pressure build-up.	Wear insulated gloves. Always work in well-ventilated areas. Always transport dry ice in containers approved for transport, ensuring that the CO_2 can diffuse minimizing pressure build-up.

Liquid Nitrogen (LN2)	LN2 is a readily transportable and highly effective compound used for the cryopreservation of blood, reproductive cells, and other biological samples and materials. LN2 is produced through the distillation of liquid air, and is stored and transported in vacuum flasks insulated from ambient heat.	LN2 can often be locally obtained through international airports (urban areas), and services that work with artificial insemination (beef/dairy industry located primarily in rural areas). LN2 boils at -196°C, and can cause rapid freezing on contact with living tissue, and severe damage to materials if spilt.	Wear insulated gloves, a thermal apron and a face shield. Always work in well-ventilated areas. LN2 tanks feature pressure relief devices, which if not routinely checked and properly maintained can fail resulting in tank explosion and considerable damage. Consult the manufacturer's recommendations for tank maintenance to ensure compliance. Transporting LN2 tanks or dewars inside project vehicles can be dangerous: there is a risk of rupture or tank failure, and the tanks can potentially explode. When possible, transport LN2 in dry shippers or vacuum flasks approved for transport. If using LN2 tanks or dewars, be sure to secure these containers on the exterior of the vehicle to maximize safety in transport. LN2 tanks should only be placed in an upright position.

Containers for Cold Chain Transport and Shipping

There are two main types of LN2 containers: dry shippers (vapor shippers) and vacuum flasks (dewar flasks). The insulating capacity of LN2 containers varies considerably from a few hours to weeks, requiring constant vigilance for signs of leakage, and routine assessment of container temperature.

Dry shippers (vapor shippers)

Dry shippers are large vacuum containers that contain an absorbent material to hold LN2. A properly prepared dry shipper does not contain any free LN2, and can safely store samples at the optimal temperature range for a period of 24 hours to several weeks depending on the type. Dry shippers are highly recommended for sample storage when samples need to be transported or shipped (bicycle, car, airplane, etc.). Because of their transport utility, dry shippers are often smaller and more compact, and well suited to more short-term storage applications.

Vacuum (dewar) flasks

Vacuum flasks are non-pressurized LN2 containers lacking absorbent material, in which biological samples or specimens are suspended in LN2 within the container. Vacuum flasks should not be used to transport or ship biological specimens. Rather, vacuum flasks are suited

for longer-term storage application (storage time dependent on size of the flask – consult the manufacturers guidelines) in laboratories, field offices, or other locations where samples are expected to reside for longer period of time. Vacuum flasks come in a range of sizes from small to very large capacity containers.

Recommended steps for using dry shippers/vacuum flasks:

- Always consult and follow the manufacturer's instructions for filling, as procedures for each type of container can vary.
- Always wear a face shield and insulated gloves made for handling liquid nitrogen.
- Always work in well-ventilated areas, as a significant amount of nitrogen gas will be generated as the cold liquid contacts the warm surfaces inside the shipper.

Refrigerators and Freezers

Domestic (e.g., household/home) refrigerators and freezers are designed and built for food and drink storage; they do not meet the requirements for sample storage, and do not reach the temperature levels needed for preservation of PREDICT biological material (e.g., specimens for viral screening). **DO NOT STORE SAMPLES IN REFRIGERATORS OR FREEZERS THAT CONTAIN FOOD OR BEVERAGES FOR CONSUMPTION.** In addition, temperature in domestic refrigerators varies significantly with door opening, defrosting, and variable ambient temperatures; they should not be used in a cold-chain for storage of PREDICT samples. Additionally, freezers designated as "frost free" should not be used for sample storage; because the temperature cycling mechanisms they utilize to avoid ice accumulation can damage samples.

Only specially designed ultra-low temperature (< -80°C) commercial freezers are recommended for use with samples when viral isolation is an objective.

Ultra-low temperature (< -80°C) commercial freezers

Commercial freezers come in a variety of temperature settings (-20, -40, -50, -85, and cryogenic freezers at -150°C), and in a variety of configurations (upright, chest, and bench top freezers). It is important to be sure any commercial freezers utilized for biological sample and specimen storage are able to consistently maintain a sub 80°C environment.

Operating a commercial freezer requires a constant source of electricity to maintain temperatures colder than -80°C temperatures and ensure the viability of the cold chain. In many places where PREDICT projects are being conducted, electricity is intermittent and blackouts are common. **It is imperative that the electrical source for a commercial freezer be supported by a back-up generator to ensure continued power for the freezer and viability of the samples.** It is equally imperative that each team has a contingency plan for power outages, to ensure that the back-up generator is functioning and that the freezer remains operational. Teams should clearly mark the power source to the freezer to prevent accidental disconnection, which can cause heat damage if unnoticed over long periods of time. The power source can also be protected by placing a sticker above the power plug or switch, or by installing a lockable

switch. Additional steps on maintaining the cold chain during blackouts are included in Section 3 below.

The location of the freezer in the laboratory or field office impacts performance. Avoid placing a freezer in direct sunlight or near heat sources (hot water or a warm external wall), because that makes the freezer work harder to maintain cool temperatures. In addition, -80°C freezers often require a certain amount of airspace in their immediate surroundings for ventilation and to function efficiently; -80°C freezers should not be located in close proximity to other freezers, equipment, counters, etc. When possible, leave at least 1 meter of space between the -80°C freezer and other freezers or equipment.

Temperature Gauging Equipment

Continual temperature monitoring of the cold chain assures that all samples remain in an optimal environment for preservation. There are a number of methods to monitor cold chain temperatures, from simple thermometers to more complex temperature gauges, cold chain monitors, and data loggers. When combined with an appropriate record keeping system, temperature monitoring provides an ideal method to evaluate the viability of the cold chain and to respond accordingly to any interruptions.

Table 2: Temperature gauging equipment used in the cold chain.

Type	Description	Guidelines for use
Thermometers	Minimum/maximum thermometers are essential equipment for temperature monitoring, and come in two main types: dial and digital.	All thermometers used for temperature monitoring should be set to Celsius, must be reset on a daily basis, and require annual checks to ensure accuracy, as battery failure or damages temperature probes can impact readings. In addition, a temperature-monitoring chart should be maintained to provide a record of variation in temperature that may indicate problems with the freezer or thermometer.
Temperature Chart Recording Systems	Temperature Chart Recording Systems are automated systems that record temperature and provide visual or audio alarms at signs of malfunction.	These systems are fully automated and provide digital output of temperature variations over time. These are typically after-market modifications to freezers, and if installed, should be verified to function with the freezer manufacturer as they may void product warranty.
Data loggers	Data loggers are used to record temperature patterns over time by recording temperature data electronically, and providing an electronic and downloadable record.	Data loggers are not a replacement for manual monitoring, and daily minimum and maximum temperatures should still be recorded to ensure the maintenance of the cold chain. When used for routine temperature monitoring, a data logger must be equipped with a visual min/max temperature display to allow for daily real-time recordings.

Cold chain monitors	Cold chain monitors generally consist of dual-time temperature indicators (WarmMark™ and MonitorMark™) and function by displaying changes in temperature through color change on an indicator strip. Other types of cold chain monitors include freeze indicators (Freeze Watch™, ColdMark™) consisting of color bulbs that release a dye at a threshold temperature. There are also combined indicators featuring dual time-temperature indicators and freeze indicators.	Cold chain monitor color change allows for an estimation of the amount of time a temperature exceeds a pre-determined threshold. No color change means the cold chain was not interrupted and temperature remained safe for sample transport. Note: these monitors are often for temperatures warmer than -80°C (e.g. cold boxes/coolers, refrigerators, -20°C freezers) and are often not designed for samples kept at or colder than -80°C.

Management of Cold Chain Equipment.

Procuring the needed equipment is only one aspect of keeping a functional cold chain. Equipment management and maintenance is equally important, and requires:

- Maintaining an equipment inventory
- Planning and budgeting for equipment operation (e.g., electricity), maintenance, and repair
- Planning and budgeting for equipment replacement
- Emergency response or contingency planning in the event of cold chain breach or equipment failure

Equipment Inventory

An inventory should be developed to track all equipment, tools, and parts that are used as part of the cold chain. A good inventory will allow team members to track the location of all materials used in the cold chain, schedule maintenance and repair, arrange for replacement and evaluate the project supplies. Table 3 includes some information recommended for a sample storage equipment inventory.

Table 3: Sample storage equipment inventory database example.

Item	Specifications (brand, model, SN, date of acquisition)	Current Location	Current Condition (Working, Under repair, Out of commission)	Date of purchase – warranty number	Estimated Replacement Date	Notes
Ultra-low freezer	TS Revco ElitePlus, S/N 007054568, Oct. 2010	Morogoro	Working	September 2010	October 2013 (MFR warranty expiration)	Recently purchased and installed
Dryshipper	MVE Cryomoover, S/N 9989900745, Oct. 2010	Serengeti, PREDICT Mobile team	Working	September 2010	October 2013 (MFR warranty expiration)	Field sampling with TAWIRI team
LN2 Generator	StirLITE, S/N 356777456, Oct. 2010	Iringa, PREDICT office	Out of Commission	September 2010	October 2013 (MFR warranty expiration)	Installation issues: working with support services to resolve; sourcing LN2 from supplier in Dar es Salaam currently.

Equipment Operation, Maintenance, and Repair

All equipment requires maintenance to protect against failure and degradation. Maintenance planning involves identifying procedures and plans to keep equipment functioning properly, as well as planning for emergency repair in the event of equipment failure. Some equipment requires routine maintenance (daily, weekly, or monthly), while others may require maintenance following use (dry shippers, vacuum flasks, cold boxes, etc.). Maintenance instructions are usually included with the equipment, and can often be obtained from the manufacturer. It is important that team members receive training in routine maintenance and repair within reason, while skilled technicians should be identified for complex maintenance and repair procedures.

In addition, it is important to estimate the costs of installing, operating, and maintaining the equipment. Ultra-low temperature freezers utilize significant quantities of electricity, though newer models are designed to minimize power consumption. It is possible that the installation of new equipment will drastically increase power consumption requiring a re-budget of operational costs.

You may use the following equation to estimate the cost of your electrical equipment using the manufactures specifications to obtain the value for kilowatt hours (kWh). [kWh / 24 h] x [kWh costs in your location] x [365 days] = Operational Cost / Year

Maintenance of equipment over time will also require a budget, and should be included in operational cost planning.

Equipment Replacement

Equipment will eventually wear out, and if plans are not in place to address equipment failure, a significant cold chain breach may occur (See Section 6.1.3.). It is important that teams understand the lifecycle of all cold chain materials and equipment, and that plans are in place to address equipment failure when it occurs. Most manufacturers provide estimates of equipment life expectancy. When developing the equipment inventory, estimated replacement dates should be included in documentation to assist in replacement planning. As equipment can often take months for order and delivery, temporary cold chain storage plans should be considered to ensure no breach or interruption.

Emergency Planning

Cold chains are fragile, material dependent, and subject to interruption through breakdowns of background infrastructure (electricity failure) and equipment failure (leakages of cold storage containers or freezer malfunction). Team members must set up emergency planning for identifying equipment failure early, along with arrangements for maintaining the cold chain during repairs or replacement. Equipment outages caused by shortages of spare parts or materials should not occur.

Power surges and "brown-outs" are often frequent occurrences in areas where PREDICT teams are active. A brown-out is a drop in voltage in an electrical power supply, most commonly observed by the dimming of lights. Black outs are covered below in the Section 6.1.3.. To prevent adverse impacts to cold chain equipment during power surges, it is imperative to have stand-by generators, back-up power sources, and other mechanisms in place (surge protectors, CO2 backup systems, etc.). Often electrical equipment is sensitive to undercurrent (for example a 220V system running at 205V temporarily), and equipment failure and destruction is possible.

Section 6.1.2b. Recommended Temperature Requirements for Sample Transport and Storage

An essential component of cold chain planning is knowing the optimal temperature requirements for different diagnostic methods, sample types and storage media.

For PREDICT purposes all samples (stored in VTM and Trizol) must be frozen in liquid nitrogen immediately in the field and transferred to a -80°C freezer once back in the lab. If the location of the field site allows, you may use short term (maximum 48 hrs.) refrigeration (i.e., ice/gel packs) prior to transfer to -80°C freezer or LN2 dewar.

ONLY if there is no **short term** access (i.e., within 24 hours) to cold chain such as in an emergency situation samples can be collected in 200 µL of RNAlater instead of Trizol and VTM. Storage times and temperatures for samples in RNAlater are as follows: 1 day at 37°C (i.e., room temperature), 1 week in the refrigerator, and transfer to -80°C for long term storage as soon as possible and within 1 week until analysis.

Do not collect samples onto dried blot spot cards.

Section 6.1.2c. Cold Chain Initiation at the Sampling Sites

Following collection in the field, samples must be immediately introduced to the optimum temperature range. When possible, collected samples should be initially stored in cryotubes allowing for immediate introduction to the cold chain and minimizing any freeze/thaw issues involved in sample transfer at a later time.

Table 4 provides an overview of temperature ranges used in PREDICT activities, along with procedures for optimizing these ranges for short-term storage. This table is followed by recommendations on the use of referenced equipment.

Table 4: Maintenance of transit temperature by optimum temperature range.

4°C *Commercial Refrigerator or "on-ice"*	**-70°C** *Dry ice*	**-80°C or colder** *LN2*
Time interval: 1-2 days (chilled). Limit to a minimum	Time interval: 1-2 days (frozen).	Time Interval: Indefinite (as long as LN2 quantities are maintained)
*Procedure: The sample transport container (cold box or cooler) should be fitted with as many ice/gel packs as possible. Temperature should not exceed 4°C. If available, a cold chain monitor should also be inserted.	*Procedure: Place a minimum 1 kg of dry ice per 1 kg of samples (but double or triple dry ice amount if possible) for every 24 hours in transit. Place in a sturdy Styrofoam container, allowing for release of carbon dioxide gas to prevent explosion. Use solid dry ice cubes when possible as their duration greatly exceeds that of chips or snow.	*Procedure: Place samples into special cryotubes with screw-down lids (no snap-tops). Cryotubes are then inserted into a LN2 "charged" dry shipper or vacuum flask.

**Maintain at least 4 frozen gel packs and an additional transport container as a contingency plan in case of package or container failure with dry ice or LN2.*

Using temporary cold boxes or coolers

Insulated cold boxes or coolers may be used for sample transport of less than 48 hours duration for all samples requiring storage at -80° C or if no LN2/dry ice supplies are available, or during equipment failure or emergency maintenance periods.

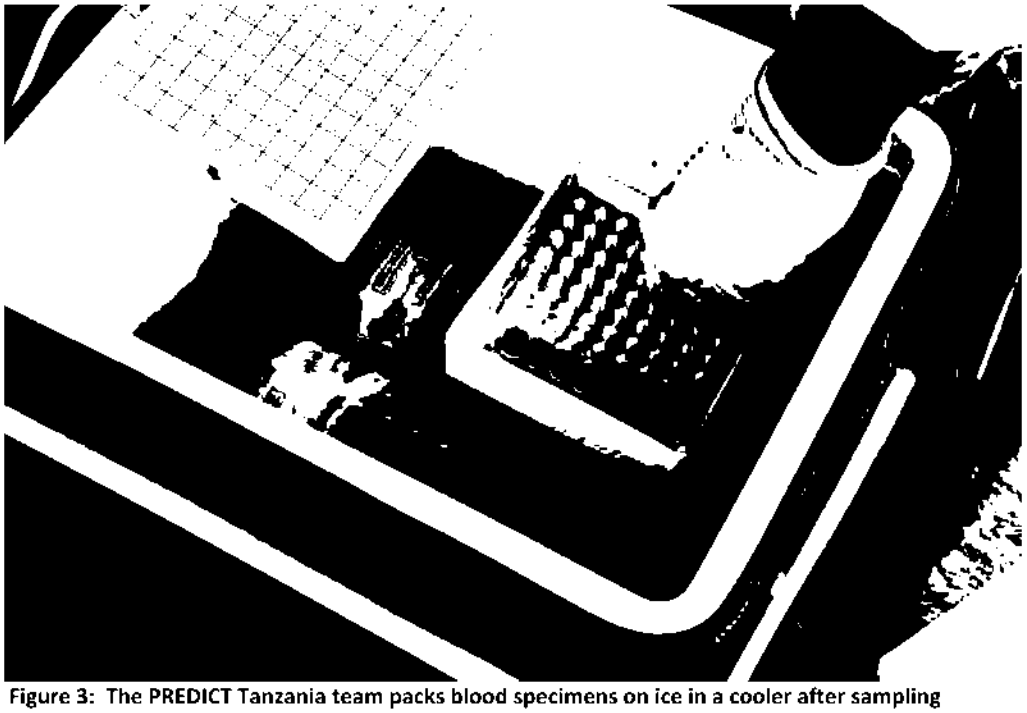

Figure 3: The PREDICT Tanzania team packs blood specimens on ice in a cooler after sampling rodents. Other specimens from field collection were stored in LN2 consistent with sample storage guidelines (Table 6). Photo by Liz Vanwormer.

Recommended steps when using cold boxes or coolers:

- Samples must be protected from heat, sunlight and fluorescent light at all times.
- Check the temperature in the cold box using a mercury or digital thermometer every 3 hours. Note: repeated opening and closing of the cold box will cause temperatures inside the box to elevate more rapidly. Teams must use good judgment when deciding to monitor the cold box temperatures.
- Rotate ice/gel packs to maintain maximum coldness within the container. If possible have extra ice gels to replace thawing or thawed ones.
- Do not transport samples in the trunks of vehicles (or the floors of some vehicles) due to the risk of exposure to temperature extremes. Be familiar with the coolest part of the vehicles.
- Do not remove samples from cold box or cooler until ready to transfer to recommended vacuum flask, dry shipper, or commercial freezer.
- When transferring samples, do not leave them out on the counter or the floor subjected to room temperature and light.
- Keep records of amount of time samples were stored at temperatures warmer than -80°C, and record the date and time when samples were introduced to the -80°C cold chain.

Using containers with dry ice

Dry ice (-78.5°C) is colder than ice and gel packs and allows for maintenance of samples frozen in transit. Any specimens transported in dry ice must be placed in specially insulated containers capable of venting gaseous CO2.

Recommended steps when using dry ice:

- Pack samples in a good insulated container. Thick polystyrene/styrofoam boxes work well with dry ice as they allow for the necessary off gassing of CO_2 (release of CO_2 gas) and are durable enough to last through transport.
- Sufficient dry ice is needed for maintaining samples consistently frozen. If dry ice quantities are insufficient samples will thaw and rendered useless.
- Use a minimum 1 kg of dry ice for each **1** kg of samples for every 24-hour transit period. Keep in mind however that depending on the quality of your shipping container and environmental conditions you will need to adjust these quantities to ensure constant temperatures. In hot conditions and whenever possible use double or triple the recommended dry ice quantity (i.e., 2 or 3 kg dry ice per kg of samples). For longer than 24 storage/transit times, double the amount of dry ice.
- When packaging items, place dry ice and sample containers as close together as possible and cover with additional dry ice. Fill any empty space with newspaper (ideal) or cloth, bubble packs, or Styrofoam peanuts. Empty space allows the dry ice to sublimate (change from liquid to gas) more quickly.
- Dry ice blocks take longer to evaporate and are better at maintaining samples frozen for longer storage/transit periods. However, samples must be close to dry ice (or surrounded by it) for adequate preservation. Solid blocks of 2-3 kg are ideal, yet not always available. Avoid using "snow" or chip dry ice whenever possible as they evaporate very quickly.

Using dry shipper or vacuum flask storage (LN2)

Dry shippers and vacuum flasks when properly charged provide ideal low temperatures for preservation of PREDICT samples both in the short-term following sample collection, in transport, and in the long-term as samples await analysis and/or shipping for diagnostics.

Recommended steps for filling dry shippers/vacuum flasks for sample transport:

1. Use appropriate PPE!
2. Add the LN2 slowly into the container.
3. Stop filling the container when the liquid reaches the neck of the dry shipper. (**DO NOT OVERFILL**)
4. Then, attach the cap and set the container aside to saturate the absorbent for the period specified by the manufacturer. This is called "charging" the container.
5. Repeat the steps above until the liquid level no longer drops on standing (e.g. the container is "charged"). Some manufacturers provide empty and full weights for their containers. If the dry shipper will not reach the expected full weight specified by the manufacturer, there may be a problem with the absorbent's ability to hold the LN2, and could indicate the container is compromised, and that samples transported or stored in the container may be at risk of degradation. In this case, contact the manufacturer or supplier of the equipment to assess whether the container is fit for use with biological samples.
6. Remove all free liquid nitrogen from the container prior to transport.
7. Empty the container by pouring the excess liquid nitrogen back into a large LN2 vacuum flask.
8. If the LN2 cannot be poured back into the flask, pour the LN2 into an appropriate area.
9. Do not pour LN2 onto the floor or onto hard surfaces. LN2 can crack and destroy concrete and other hard surfaces, and the liquid could splash onto your shoes or legs and cause severe burns.
10. Ensure that any area where LN2 is poured away is well ventilated. Remember that handling or spilling LN2 in a small, confined space has been known to cause fatalities via asphyxiation /displacement of oxygen. Appropriate safety precautions outlined in the Protocol above must be considered.
11. After pouring out excess LN2, hold the dry shipper or vacuum flask upside down to be sure that all liquid has stopped flowing.
12. Stand the dry shipper upright for the period specified by the manufacturer.
13. Repeat the LN2 removal steps as many times as necessary to make sure there is no excess LN2 in the container.
14. Put the samples into the dry shipper/container and replace the cap.
15. Record the date, time, and ID of the samples for when they were placed into the container to initiate the cold chain data log.
16. Ready the dry shipper/container for transport by securing the container in the vehicle. If using a protective bin for the container, then secure the container in the bin first, before securing the bin in the vehicle.

Recommended steps for using dry shippers or vacuum flasks for sample storage:

- Make sure containers are fully charged prior to deployment in the field or removal from dry ice/LN2 source (See steps on filling shippers/flasks above).
- Make sure containers are not leaking.
- Make sure to have sufficient quantities of LN2 on hand for sample storage and emergencies.
- Develop a plan for obtaining additional dry ice/LN2 supplies in the event of emergency or container failure.
- When in the field, always keep additional cold boxes with conditioned (e.g., properly prepared) ice/gel packs as back up in event of container failure.
- Following sample collection, organize samples in the containers according to animal or sample ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from containers only when ready to prepare for analysis or shipping.
- Record the length-of-time samples were kept in containers and document the number of times and duration containers were opened.

Figure 1: The PREDICT Tanzania team packs up equipment after collecting specimens from rodents. The mushroom shaped container in the background is a specially designed transport container for LN2 dryshippers, ensuring the dryshipper container is well protected during overland or air travel, and that all stored specimens are well within the temperature range required for viral isolation. Photo by Liz Vanwormer.

Section 6.1.2d. Sample Transport

Following sample collection, it is imperative that the field teams coordinate with the receiving laboratories or PREDICT Country Coordinators on all details involving sample transport and storage planning. In many cases, samples will be delivered from the field/collection site to a temporary storage facility prior to shipment to end-use processing laboratories, and may involve multiple phases of the cold chain. In the event of international transport of samples to a processing laboratory, all PREDICT personnel must follow the guidelines specified in ***Section 6.2 Packing and Shipping Biological Samples*.**

All sample transport containers must be secured (e.g., tied down) in the transport vehicle. If possible, LN2 dryshippers should be secured in a separate compartment space from the passengers (e.g., rooftop bin or a covered canopy of a flatbed truck), and equipped with a spill kit containing absorbent materials to protect personnel from any accidents involving spillage. Non-LN2 containers with unprocessed samples may be secured in the project vehicle with proper secondary containment to minimize sample jostling during transport. There is a risk that containers may leak during transport, so it is imperative that teams understand the risk of asphyxiation in a closed vehicle and be prepared to address any spills and leakages with appropriate equipment. **PREDICT vehicles should be equipped with cold chain PPE (e.g., disinfectant, heavy reusable gloves, disposable gloves, mask, apron, goggles, and a sealable and leak proof disposal container) to respond to any incidents involving sample spillage**. To ensure maintenance of the cold chain, additional ice/gel packs, dry ice and appropriate containers, or an additional LN2 dry shipper should be available to prepare for travel delays or primary container failure.

Section 6.1.2e. Safe Storage of Samples

Upon delivery of samples from the field, it is the responsibility of the receiving party to ensure that cold chain is continued and samples are appropriately stored, documentation transferred (See Section 6.1.3.. Records below), and Country Coordinator or other supervisor notified. **For PREDICT purposes ALL SAMPLES must be stored frozen at -80°C or lower temperatures.**

Additional Sample Storage Guidelines

- Samples should be divided or aliquoted into the smallest useful units during initial processing in order to avoid excessive freeze-thaw cycles, and to avoid damage leading to a loss of infectivity.
- When samples are removed from cold storage and shipped to a laboratory facility for analysis, teams should follow the PREDICT training guidelines on ***Packing and Shipping Biological Samples (Section 6.2)***.

Long-term Sample Storage

It is strongly recommended that all samples kept for long-term storage be maintained at temperatures at or below -80°C. This can be achieved either through the use of large capacity LN2 dewars or through ultra-low temperature freezers.

Using Liquid Nitrogen

There are generally two types of sample storage systems available for LN2 dewars: box/rack (or canister systems) and cane/straw systems. While cane/straw systems are acceptable for short-term storage, it is highly recommended that samples for long-term storage be kept in box/rack systems, which allow for quick retrieval and identification with minimal temperature reduction upon retrieval. Cane/straw systems have less storage capacity and often increase the amount of time required to locate samples for pathogen testing.

Recommended steps for using LN2 in long-term sample storage:

- Make sure containers are filled to capacity, functioning properly, and are not leaking.
- Develop a plan for obtaining additional LN2 supplies in the event of emergency or container failure.
- Maintain a supply of ice/gel packs to maintain temperature in the container in the event of container failure, or for use in emergency storage or transport.
- Organize samples in box/rack systems according to animal or specimen ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from containers only when ready for testing or shipping.
- Record the length-of-time samples were kept in containers and document the number of times and duration containers were opened.

Using Ultra-low Temperature Freezers

Like samples in LN2, samples stored in ultra-low temperature freezers (-70/80°C and colder) must also be easily identifiable and organized in a way to minimize the time required for sample location and access. Freezers must be well managed, and staff must be prepared for disruption of electricity, blackout, or other event where the freezer malfunctions.

Recommended steps for using ultra-low temperature freezers:

- Store material in the freezer leaving space between boxes/containers to allow for air to circulate.
- Organize samples according to animal or sample ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from freezer only when ready to prepare for testing or shipping.
- Minimize the number of times the freezer is opened, and make sure the freezer door is closed tightly.
- Secure the electrical outlet and freezer plug to prevent accidental disconnection and freezer failure.
- Post a highly visible sign or sticker by the electrical outlet to ensure the freezer is not unplugged, or cover the electrical outlet with a cage to prevent disconnection.
- Maintain a supply of ice/gel packs in the freezer to maintain temperature in the event of freezer failure, and for use in emergency storage or transport.
- Employ a temperature monitoring system.
- Train all staff members in monitoring and documenting temperatures.

Section 6.1.2f. Cold Chain Maintenance

Checking, Recording and Monitoring Cold Chain Temperature

Implementing a temperature-monitoring plan through consistent and regular thermometer readings is essential to maintaining a secure and reliable cold chain.

Recommended Steps for Cold Chain Temperature Monitoring:

- Check LN2 levels and container temperature (if using gauge), and ensure that the container is not leaking twice per day in the mornings and evenings.
- Check and record freezer temperature twice per day in the mornings and evenings (Figure X) as follows: (Note: these readings must be done more frequently if samples are temporarily stored in cold boxes or coolers).
    - Check and record the current freezer temperature.
    - Check and record the maximum freezer temperature.
    - Clear the maximum reading after it is documented.
    - Check and record the minimum freezer temperature.
    - Clear the minimum reading after it is documented.
    - Reset the thermometer.
- Do not open the freezer door to take the temperature readings; an external temperature gauge should be used for commercial freezers.
- Change the thermometer or temperature gauge battery every 6 months (i.e., seasonally with the time change) or as recommended by the manufacturer, as a low functioning battery may give false temperature readings.
- Keep a supply of spare batteries in case of device failure.

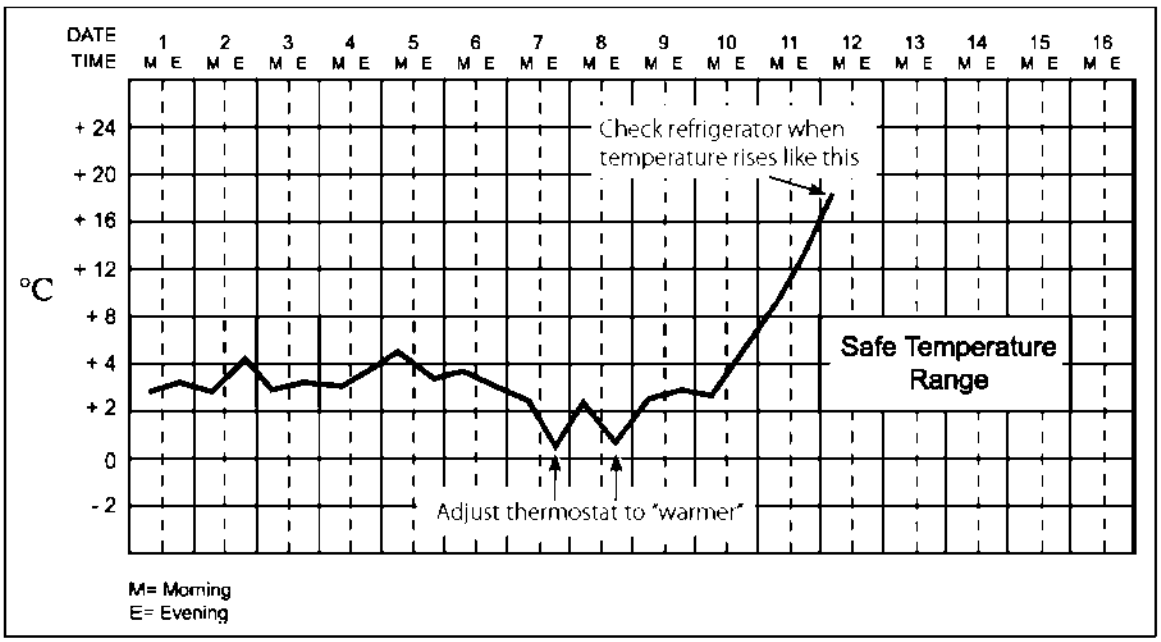

Figure 5. An example of a cold chain temperature monitoring chart. Source: WHO, 2004.
Note: this chart is for a cold chain optimized for vaccines at 2-8ºC. Use the chart included in the Appendix for the PREDICT cold chain at lower storage temperatures optimal for viral isolation.

Section 6.1.3. Contingency Planning and Responding to a Cold Chain Breach

Preserving and maintaining below freezing temperatures in tropical conditions requires attention to detail and intensive logistical planning, linking equipment, people, policies, and procedures into an integrated system. Country coordinators, laboratory technicians, and field personnel all have a role to play in ensuring that PREDICT samples are collected, transported, stored, and shipped (if necessary) without breaks in the cold chain. In addition, team members must be trained and prepared to address incidents in which there is a cold chain breach, to enact response measures for rapid cold chain rehabilitation.

Contingency Planning

It is imperative that all PREDICT teams have a pre-determined contingency plan for maintaining the cold chain in the event of freezer or container malfunction or electricity disruption. It is highly recommended that all facilities using commercial -80°C freezers be linked with a back-up generator for continued electrical operation (see box below). However, it is the team's responsibility to make sure that the back-up generator is of sufficient capacity to operate the freezer, is functioning and has sufficient fuel to maintain electricity, or that alternative measures for maintaining the cold chain are necessary. Arrangements with other facilities for temporary sample storage (if necessary) should be made in advance, along with plans for rapid sample transfer with minimal cold chain disruption.

Essential Steps in Setting-up your Back-up Generator System

Generators should be connected to freezers before a power failure to determine:

a) If the generator can effectively operate the freezer
b) The temperature at which the freezer operates when connected to the generator, and whether an appropriate temperature is maintained for samples over an extended period of time
c) How long the generator can be used in the event of a power outage

If these three conditions are met, then the generator is sufficient to act as a back-up system in the event of a breach. If these conditions are not met, please see "Recommended Steps for Contingency Planning" below.

Recommended Steps for Contingency Planning:

- Identify possible sources of cold chain interruption or breach (e.g., equipment failure, supply shortages, power outages, etc.).
- Identify preparations and solutions for possible chain interruptions
- Prepare back-up infrastructure for sample storage.
- Identify alternate storage facilities for samples and initiate communication to facilitate emergency use.
- Monitor and evaluate equipment regularly and maintain records to assist in understanding potential weaknesses in the cold chain.
- Ensure staff are trained on cold chain maintenance and monitoring for prevention of a breach.

Recommendations for a Power Failure Contingency Plan

Power Failure Contingency Plan (Example)

Start-up the Generator! If Generator is not working, or is insufficient to provide adequate backup (See Box above), then proceed with these steps below:

Samples stored in refrigerator

Monitor the temperature of refrigerator (temperature gauges should be battery powered).

During a power failure of 4 hours or less, the refrigerator door should be kept closed at all times.

If samples are at risk of warming, implement alternative storage arrangements. All samples must be transferred to cold boxes/coolers with prepared ice/gel packs. Monitor sample temperature through the use of a thermometer probe placed near the samples inside the cold box or cooler.

Samples stored in commercial freezer

Monitor the temperature of freezer (temperature gauges should be battery powered).

If samples are at risk of thawing, implement alternative storage arrangements (either in dry ice or LN2, or in cold boxes and coolers with prepared ice/gel packs).

Responding to a Cold Chain Breach

A cold chain breach is an interruption in the cold chain exposing samples to temperatures above the required range for viral preservation (for prolonged periods – opening and closing a freezer door will often cause temperature fluctuation, but does not qualify as a "breach"). If not quickly rehabilitated, such an interruption can destroy sample viability and render samples useless for PREDICT pathogen testing activities. It is imperative that all teams have documented plans for addressing a breach in the cold chain, and that all team members have received training on appropriate response and cold chain rehabilitation.

Recommended steps in responding to a cold chain breach:

1. Contact your PREDICT Country Coordinator (or supervisor) as soon as possible for advice on emergency response measures, and consult your contingency plans.
2. Define the incident: check all temperature monitoring records, equipment, and discuss with staff possible explanations for the breach.
3. Confirm accuracy of equipment by referencing manufacturer specifications to ensure that the breach is not simply equipment malfunction (data loggers, cold chain monitors and temperature gauges may have operational failure. It is important that emergency measures are not implemented until staff is certain the failure is with the freezer or storage container).
4. Assess the condition of the freezer/storage container. Can the cause be identified (e.g., leaky dewar, freezer door no longer closing completely)?
5. Record:
    a. When the cold chain was last guaranteed?
    b. What monitoring has been recorded prior to breach?
    c. What is the time interval of breach?
    d. What is the temperature range of the breach period?
    e. What samples were involved in incident? Enter record in sample database.

6. Continuously monitor temperatures of the containers/freezers and record the duration of time samples are exposed to temperatures warmer than -80°C.
7. If temperatures approach -30°C, begin planning for sample transfer to temporary cold boxes or coolers, or other laboratory facilities.
8. If temperatures climb to warmer than -20°C, transfer samples to temporary storage containers and continue monitoring temperature. If there is no -20°C capacity, actively pursue an alternative storage facility and prepare insulated boxes for sample transport.
9. DO NOT discard any samples until advice has been sought from PREDICT Country Coordinators and laboratory personnel.
10. Label all samples exposed to elevated temperatures in the PREDICT sample tracking information database.

Take active steps to correct and prevent the problem from recurring.
In the event of a cold chain breach, it is important to keep records to guide in response implementation, to help prevent future breaches, and to inform PREDICT team members of any potentially affected samples. The following table includes an example data sheet for a cold chain breach. A blank data sheet is included in the Appendix.

Example data sheet for cold chain breach

Date and suspected time of the breach	Date: Aug. 13, 2010	Time: 5:14 PM
Do you store your samples in a commercial freezer or vacuum flask container?	Commercial Freezer	LN2 vacuum flask
Minimum and maximum temperature readings	Minimum: -88°C	Maximum: -57°C
When was the thermometer last reset	Dave of reset: July 12, 2010	Time of reset: 11:12 AM

Section 6.1.4. References

Commonwealth of Australia, Department of Health. 2003. *Cold Chain and Immunization Operations Manual: Guidelines for handling heat sensitive vaccines and pharmaceuticals.*

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World Health Organization Department of Immunization, Vaccines, and Biologicals. 2004. "Ch. 3. The Cold Chain Module." In *Immunization in Practice: A practical resource guide for health workers (CD)*. World Health Organization.

Section 6.1.5. Appendix I. Datasheets and Checklists for Cold Chain Planning and Implementation

Equipment Inventory Template

Item	Specifications (brand, model, SN, date of acquisition)	Current Location	Current Condition (working, in repair, out of commission)	Date of Purchase	Estimated Replacement Date	Notes

Equipment Maintenance Record Template

Model No.	Serial No.	Purchase Date	Last Service Date	Work (Maintenance) Performed

**Note: It is also recommended that teams catalog recommended maintenance forms, registries, and schedules that accompany equipment to help plan for equipment maintenance and minimize interruptions in the cold chain. It may also be helpful to keep a record of responsible team members so staff are aware of equipment maintenance duties.*

Data Sheet Template for Cold Chain Breach

Date and suspected time of the breach	Date:	Time:
Do you store your samples in a commercial freezer of vacuum flask container?	Yes	No
Minimum and maximum temperature readings?	Minimum	Maximum
Are Cold Chain Monitors (CCMs) stored with the samples? If 'yes', be ready to report the reading when breach was noticed.	Yes	No
When was the thermometer last reset?	Date of reset:	Time of reset:
When was the thermometer battery last changed?	Date of battery change:	Time of batter change:
When was the last check on the accuracy of the thermometer done?	Date:	Time:
How long do you think the temperature was above -80°C?	Minimum Estimate	Maximum Estimate:
How long do you think these problems have been occurring?	First breach	Recurring (state number):
Where is the temperature probe situated?	Location:	Notes:
What type and number of samples were exposed to the breach?	Type of samples:	Number of samples:
Are all samples labeled and accessible?	Yes	No
Are there ice/gel packs in the freezer to use if transfer is necessary?	Yes	No
What do you think was the cause of the cold chain breach?	Suspected cause:	Notes:
Has the cause of the cold chain breach been rectified?	Yes	No
Free fields for customization		

Temperature Monitoring Chart (-80ºC and ultra-low temperature freezers).

Date	1		2		3		4		5		6		7		8		9		10	
Time	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
-30																				
-40																				
-42																				
-44																				
-46																				
-48																				
-50																				
-52																				
-54																				
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-58																				
-60																				
-62																				
-64																				
-66																				
-68																				
-70																				
-72																				
-74																				
-76																				
-78																				

M=Mornings; E=Evening

Red: *Critical zone above freezing temperatures;* ***Green:*** *Safe zone for PREDICT samples;*

Yellow: *Temperature zone indicating thawing of samples and potential breach.*

Note: This Chart will produce a visible trend from dot plots of temperature like in Figure 6, showing your equipment's temperature variation over time. You may customize the temperature column to use with other temperature ranges as needed. This form will need to be replaced every 10 days (with dates adjusted in the "Date Column"). If using grey-scale, feel free to remove the color shading and print a simple table format.

TEMPERATURE LOG

Site: _____

Refrigerator ID#:_____ Required Temp: _____

Freezer ID#: _____ Acceptable Range: _____

ENTER TEMPERATURE AND INITIALS DAILY!

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
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21						
22						
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24						
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26						
27						
28						
29						
30						
31						

NOTE: CROSS OUT WEEKENDS AND HOLIDAYS – UPDATE FOR REMAINING MONTHS.

**This is a sample template for use with refrigerators and other equipment; it can be used together with the "Temperature Monitoring Chart" above.*

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Section 6.3. Basic Laboratory Safety

Prepared by
Tracey Goldstein, University of California Davis,
Simon Anthony, Columbia University,
Carlos Sanchez, Smithsonian Institution,
and the PREDICT One Health Consortium

Objective: To provide a safe and healthy environment for staff, volunteers and all personnel involved in PREDICT activities. This Guide is to provide basic information to ensure a safe laboratory environment and to comply with environmental standards. The recommendations in this Guide are consistent with the requirements of the U.S. Occupational Safety and Health (OSHA) Act of 1970, Executive Order 12196.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Basic Laboratory Safety.

Table of Contents: Basic Laboratory Operations

Section 6.3.1. Learning Objectives

If you understand the material in this Guide, you should be able to:

- Work safely in a basic laboratory environment.
- Recognize laboratory hazards and take the appropriate measures to reduce those hazards.
- Obtain a Material Data Safety Sheet (MSDS) for a hazardous material and explain the kinds of information in an MSDS.
- Explain important precautions to avoid needlestick injuries.
- Explain how to avoid exposure to pathogens in the laboratory.
- Describe the safety measures for a BSL 2 laboratory.
- Explain why medical monitoring of laboratory personnel is important.
- Describe the proper disposal of sharps and medical waste.
- Describe safety procedures for handling chemicals in the laboratory.

Confirm you understand the material of this Guide:
When you are familiar with the information in this Guide, take the PREDICT quiz on ***Basic Laboratory Safety (Section 8.4.16.)***.

This training module is mandatory for all laboratory and field staff.
Once you have passed the quiz please supply proof of training and completion to your supervisor.

Section 6.3.2. Principles

Guiding principles for PREDICT laboratory operations:

1. Prevent loss of life, personal injury or illness, property loss or damage, or environmental harm.
2. Comply with the ***PREDICT Environmental Compliance Protocol*** and local and national safety and health requirements.
3. Comply with applicable local building safety codes.
4. Ensure all PREDICT personnel understand relevant safe and healthy work practices.
5. Identify and assess hazards in the laboratory environment.
6. Establish overall safety and health guidelines that ensure employee safety and health at all times during PREDICT activities.
7. Periodically review and evaluate PREDICT plans, facilities, equipment, and activities to ensure that safety and health objectives are achieved.

Section 6.3.3. General Guidance for Laboratory Safety

This Laboratory Safety Guide describes safe work practices, personal protective equipment, and other control measures necessary for the safe use of chemicals and other hazardous materials

and procedures in the basic laboratory environment. PREDICT personnel involved in laboratory activities must review and follow this Guide. Staff, interns, visiting scientists, and volunteers are to receive this Guide prior to conducting laboratory activities for the PREDICT Program. This Guide will be updated as needed to improve safety procedures.

Ensure Safe Working Conditions

- Inspect your personal protective equipment (PPE), such as goggles and gloves, to ensure that each component fits well and works properly. Examine your gloves for cracks. Nitrile and latex gloves are disposable and a new pair should be used for each task.
- If you are working with PPE kits, ensure that the kit is complete (a list with the contents of the PPE kit should be available).
- Dispose of broken glass and biohazard materials in designated sharps and hazardous waste containers in the laboratory.
- Help provide a safe work environment by keeping the workspace neat and uncluttered.
- Sinks and eye wash stations should be kept clear.
- Wash your hands and forearms after you have removed and disposed of your PPE.

Hazard Identification and Assessment

Personnel should be able to recognize the possible hazards and inherent risks associated with laboratory procedures and equipment.

Table 1: Hazards associated with laboratory procedures

Procedure	Possible hazards	Likelihood of illness or injury	Risk
Using autoclave or hotplate	High temperature	Moderate	Burns
Handling animal and human samples including body fluids, tissues, swabs	Infectious organisms	Low to moderate	Pathogen exposure zoonotic diseases
Reagent preparation	Acids or alkalines Solvents (alcohols, acetone)	Low Low	Burns Inhalation irritant
Disposal of needles and slides	Sharp objects Infectious organisms	Low to moderate	Needlesticks, cuts, zoonotic disease, pathogen exposure
Dry ice, liquid nitrogen or ultra-low freezers	Extreme cold (~-100F)	Low	Burns
Media preparation	Extreme heat	Low	Burns
Formaldehyde	Inhalation of vapors, ingestion of liquid or direct contact with the liquid or vapor (skin, eye contact)	Moderate	Cancer, skin, eye and respiratory tract irritation
TRIzol Reagent (or Tri reagent; phenol solution)	Toxic if inhaled, absorbed through skin or ingested; reacts with bleach	Moderate	Contact burns, systemic poisoning; creates toxic gas if mixed with bleach

Safe Laboratory and Operating Procedures

Personnel must understand and follow the safe operating procedures of laboratory equipment and PPE to minimize health and safety risks. **The use of the PPE for specific laboratory tasks, listed in Table 2, is mandatory** and all PREDICT personnel must follow the special precautions listed for handling highly hazardous materials.

Table 2: PPE required for laboratory tasks

Lab Task	Health or Safety Hazards	Required PPE	Precautions for Highly Hazardous Materials*
Handling all samples from animals and humans (body fluids, tissues, swabs)	Zoonotic disease potential	Lab coat, closed shoes, disposable nitrile gloves, eye protection and respirator (N95 minimum)	Use of Biosafety Cabinet Class II and eye protection for samples known to be highly infectious or use PPE kits.
Handling acids or chemicals that are irritants (i.e. formaldehyde)	Respiratory irritation, acid or alkaline burns	Lab coat, laboratory gloves, face mask, closed toe shoes.	Chemical fume hood
Operation of autoclaves	Burns	Appropriate gloves, eye protection, closed toe shoes.	Care in opening the door to avoid burns from escaping steam.
Dry ice, liquid nitrogen	Burns, asphyxiation risk	Appropriate gloves, eye protection, closed toe shoes, and use in well-ventilated room.	Dispose of any unused dry ice or liquid nitrogen in ventilated fume hood.
Centrifuges	Aerosolized fluids, zoonotic disease	Lab coat, facemask, appropriate gloves when handling samples or cleaning centrifuge.	Ensure proper balancing of centrifuge and contents. Do not open until rotor has stopped. Use closed-top swinger rotors to spin biological materials.
Hot plate	Possible burns	Appropriate gloves, closed toe shoes.	Do not leave unattended for extended periods.
Use of bleach to disinfect	Possible burns, respiratory irritation	Lab coat, gloves, closed toe shoes, and eye protection.	Use of chemical fume hood recommended when preparing bleach.
Disposing of needles, glass slides	Cuts, zoonotic disease	Gloves, sharps container, closed toe shoes.	Follow sharps safety procedures in this guide.
TRIzol Reagent (or Tri reagent; phenol solution)	Contact burns, systemic poisoning	In lab: Gloves, lab coat, close toe-shoes, eye goggles In field: Gloves, close toed-shoes, appropriate field PPE (e.g. coveralls, N95 mask, goggles per the task being performed – See Biosafety Guide)	Aliquot TRIzol for sampling in the field in a ducted biosafety cabinet or fume hood; Perform RNA extraction of samples collected into TRIzol in a biosafety cabinet

Definitions

***Highly hazardous materials** are chemicals, toxics and reactives that have the potential to cause immediate and permanent harm at feasible exposure levels. Chemicals that are highly toxic, are known to cause cancer or birth defects, have very low "permissible exposure limits," are highly reactive, or that react vigorously with common materials (such as water or air) should all be considered "highly hazardous materials." Chemicals that are under pressure, that can build up pressure, that can auto-ignite at possible temperatures, that burn vigorously and energetically, or that when burning cannot be extinguished with conventional methods, should be considered highly hazardous.

For a complete and updated list of Highly Hazardous Materials, visit the following OSHA link:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9761&p_table=standards

****Personal Protective Equipment (PPE)** is specialized clothing or equipment worn by an employee for protection against infectious and other hazardous materials. The warranted components of PPE vary according to the tasks being performed by personnel. A basic PPE kit may include: gloves, gowns or other protective clothing (e.g., plastic apron), shoe and head covers, mask or respirator, and face or eye protection (e.g., goggles).

Review of Material Safety Data Sheets

PREDICT personnel must verify that a Material Safety Data Sheet (MSDS) for each product to be used during PREDICT activities is readily available, complete and updated (less than three years old).

Coordinators must ensure that personnel have read and understand the MSDS BEFORE using a chemical product.

Personnel must be familiar with the name of the chemical and understand the hazards, safe handling and storage, and specific emergency procedures BEFORE using a chemical product.

Copies of MSDSs for all chemicals used in the laboratory should be kept together in a binder and placed in an accessible location known to all laboratory personnel.

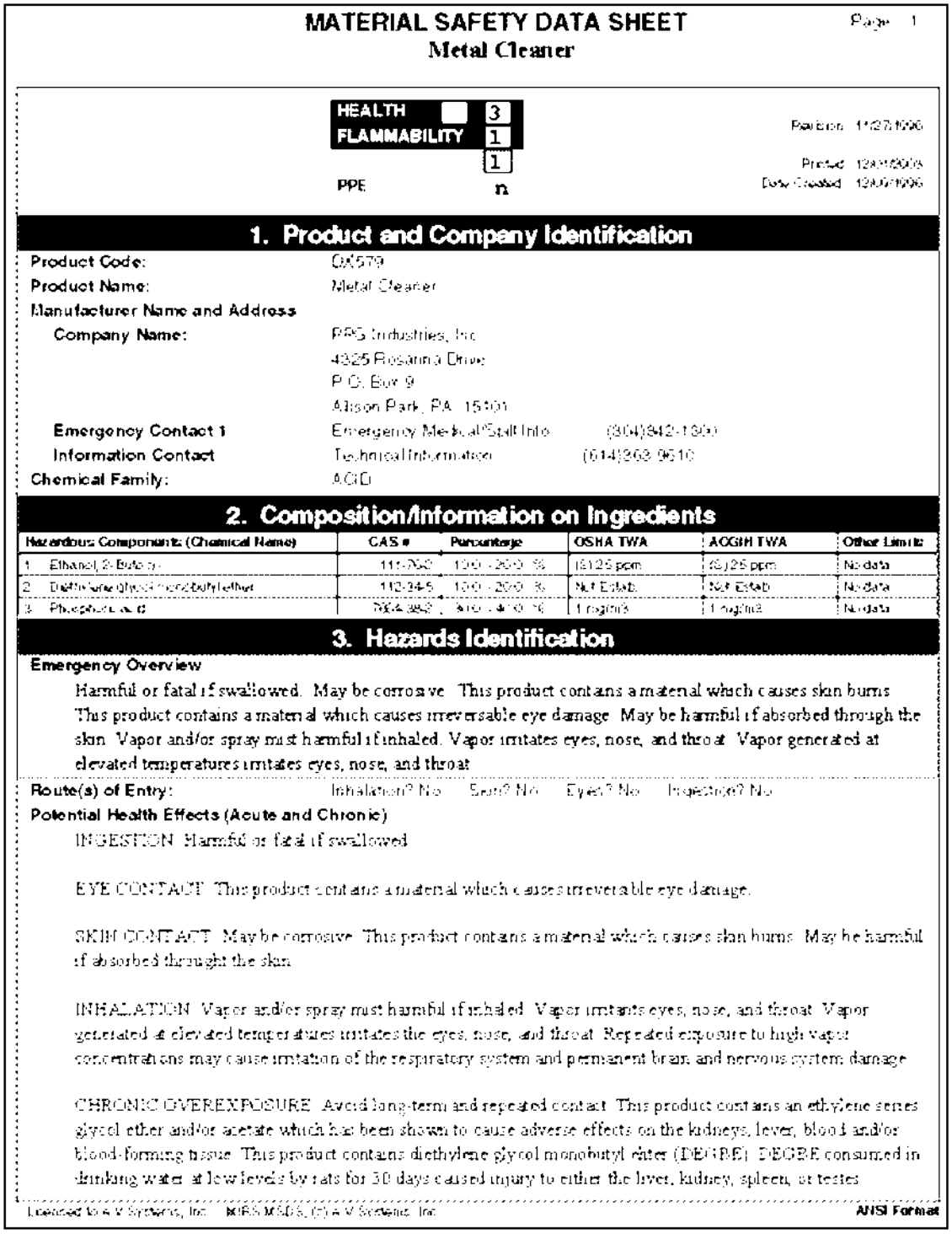
What is a Material Safety Data Sheet?

A MSDS is prepared by the supplier or manufacturer of the material and contains information on the potential hazards (health, fire, reactivity and environmental) and safe use of the chemical product. It is an essential information resource for all health and safety programs. The MSDS also contains information on the safe use, storage, handling and emergency procedures for all hazardous materials. The MSDS contains much more information about the material than found on the product label including what to do if accidents occur, and how to recognize and treat overexposure to the chemical product.

What information is on the MSDS?

The information of greatest concern to workers is featured at the beginning of the data sheet, including information on chemical composition and first aid measures. More technical information that addresses topics regarding the physical and chemical properties of the material and toxicological data appears later in the document. The 16-section MSDS is now recognized internationally. Each MSDS must include:

1. Identification (name, manufacturer and supplier names, address and emergency phone numbers)
2. Hazard(s) identification
3. Composition/information on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information



MATERIAL SAFETY DATA SHEET
Metal Cleaner

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PPE n

Revision 11/27/1996
Printed 12/31/2003
Date Created 12/27/1996

1. Product and Company Identification

Product Code: GC579
Product Name: Metal Cleaner
Manufacturer Name and Address
Company Name: PPS Industries, Inc.
4325 Rosanna Drive
P.O. Box 9
Allison Park, PA 15101
Emergency Contact 1 Emergency Medical Staff Info (304)842-1300
Information Contact Technical Information (614)268-9510
Chemical Family: ACID

2. Composition/Information on Ingredients

Hazardous Components (Chemical Name)	CAS #	Percentage	OSHA TWA	ACGIH TWA	Other Limits
1. Ethanol, 2-Butoxy-	111-762	10.0 - 20.0 %	(8) 25 ppm	(8) 25 ppm	No data
2. Diethylene glycol monobutyl ether	112-34-5	10.0 - 20.0 %	Not Estab.	Not Estab.	No data
3. Phosphoric acid	7664-38-2	10.0 - 20.0 %	1 mg/m3	1 mg/m3	No data

3. Hazards Identification

Emergency Overview

Harmful or fatal if swallowed. May be corrosive. This product contains a material which causes skin burns. This product contains a material which causes irreversable eye damage. May be harmful if absorbed through the skin. Vapor and/or spray must harmful if inhaled. Vapor irritates eyes, nose, and throat. Vapor generated at elevated temperatures irritates eyes, nose, and throat.

Route(s) of Entry: Inhalation? No Skin? No Eyes? No Ingestion? No

Potential Health Effects (Acute and Chronic)

INGESTION: Harmful or fatal if swallowed.

EYE CONTACT: This product contains a material which causes irreversible eye damage.

SKIN CONTACT: May be corrosive. This product contains a material which causes skin burns. May be harmful if absorbed through the skin.

INHALATION: Vapor and/or spray must harmful if inhaled. Vapor irritants eyes, nose, and throat. Vapor generated at elevated temperatures irritates the eyes, nose, and throat. Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage.

CHRONIC OVEREXPOSURE: Avoid long-term and repeated contact. This product contains an ethylene series glycol ether and/or acetate which has been shown to cause adverse effects on the kidneys, liver, blood and/or blood-forming tissue. This product contains diethylene glycol monobutyl ether (DEGBE). DEGBE consumed in drinking water at low levels by rats for 30 days caused injury to either the liver, kidney, spleen, or testes.

Licensed to A V Systems, Inc. MSDS MSDS, (c) A V Systems, Inc. ANSI Format

Different jurisdictions have different content requirements for Material Safety Data Sheets. Despite the internationally recognized standard, a MSDS prepared in accordance with the United States OSHA Hazard Communication Standard is not necessarily acceptable in other countries. Check with local health authorities to ensure that your MSDSs are in compliance with local regulations.

Where to obtain MSDSs for chemical products?

A MSDS can be requested from the manufacturer or supplier of the product; in addition several MSDS databases exist online including:

SIRI MSDS index: **http://siri.org/msds/index.php**
MSDS online: **http://www.msdsonline.com** or **http://www.msdsonfile.com/mctx/msds/msdsonfile.jsp**
MSDS Hazard Communication Library: **http://www.setonresourcecenter.com/MSDSs/comply1.htm**

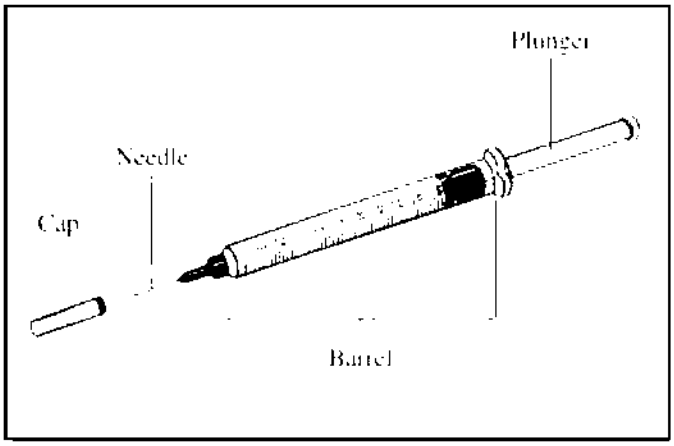
Needlestick Injury Prevention

Needlestick injuries are of concern in basic laboratory settings because they can result in the inoculation of personnel with infected materials. Additionally, skin breaks from needlesticks can act as portal of entry for environmental pathogens.

Most needlestick injuries occur during the following activities

- Recapping, bending, or breaking needles.
- Inserting a needle into a test tube or specimen container and missing the target.
- Carrying unprotected sharps.
- Leaving sharps in unexpected places, such as clothing.
- Handling or disposing of waste that contains used sharps.

Parts of a Syringe and Needle



Procedures to Prevent Needlestick Injuries

- Follow proper techniques when using needles and syringes.
- Be familiar with the different types and components of syringes and needles.
- When **uncapping a syringe needle**, pull the cap straight off to remove it and expose the needle.
- **Never leave an uncapped needle lying around.** A used syringe with the attached needle should be placed in a sharp disposal container immediately after use (a sharps disposal

container is designed for safe containment of medical articles that may cause punctures or cuts to those handling them – see below).

- **Removal of the syringe needle** may be necessary for transfer of the sample to another container, or for disposal of only the needle in the sharp container. When removal of the needle is necessary:
- Make sure not to remove the cap--twist the entire needle to take it off the syringe along with the cap. Alternatively, the needle may be removed from the syringe by use of forceps.
- Uncapped needles should never be removed from the syringe by hand.
- **Syringes and needles** used on humans should never be recapped. However, when working with animals and in the field, it may be necessary to carefully recap a needle to avoid accidental sticks if a sharps container is not immediately available.

If you recap a needle, use the *ONE HAND METHOD*

1. Lay the cap on a table or on a flat surface.
2. Hold the syringe by the end.
3. Tilt the end of the syringe up, so that the needle inside the cap is point down onto the surface.
4. Insert the needle on the syringe into the cap.
5. "Fish" up the cap with the needle.
6. Use the same hand to recap the needle.
7. Apply enough pressure to set the cap onto the needle.

If a needlestick occurs, it must be reported to your local PREDICT Supervisor and a medical professional immediately.

Section 6.3.4. Biohazards of Zoonotic Pathogens

Investigators working with domestic and wild animals and humans or with animal and human samples are at risk of disease due to exposure to zoonotic pathogens (pathogens transmitted between animals to humans). The zoonotic disease risk varies depending on the animal species being handled, but is generally caused by direct contact (e.g., contaminated/dirty hands), through open cuts, contact with blood and other body fluids, or inhalation of contaminated materials.

When performing tasks with risk of exposure to zoonotic pathogens (such as handling live or dead animals or samples from humans, collecting, testing, or packaging samples), PREDICT personnel should always wear the appropriate PPE as warranted by the assessed risk. It is the responsibility of the supervising veterinarian or medical specialist to determine the required PPE components for specific activities, based on an established PREDICT protocol or based on a risk assessment. (*See **Section 4. Biosafety and PPE Use** for more information about determining the appropriate PPE.)*

In the event that any personnel believe they have been exposed to material from a person or animal, they should immediately report the exposure to their supervisor, and if warranted seek the appropriate medical attention and follow-up.

Species-Specific Biosafety Precautions

The PREDICT Program will conduct surveillance and sampling among several groups of species. This section discusses special biosafety considerations for some of the key groups of species (bats, rodents, and non-human primates) likely to be handled as part of PREDICT activities.

Rodents, bats, non-human primates and other wild species may harbor pathogens that are transmittable to, and highly pathogenic in, humans. When handling these rodents, bats or non-human primates, careful consideration needs to be given to conscientious use of PPE, good personal hygiene (i.e., hand washing), safety training, and application of good animal handling and sampling techniques to minimize exposure to infection or injury.

In the event of an injury while handling animals that pose risk of zoonotic pathogen exposure, appropriate first aid must be applied. The risk of infection can be significantly reduced with immediate and thorough scrubbing of the wound with soap or antiseptic.

Vaccination to prevent rabies infection: Personnel who are handling animals that are known reservoirs for rabies (e.g., bats and dogs) should be immunized against rabies virus according to World Health Organization and CDC recommendations.

Investigators should familiarize themselves with known biohazards specific to species under study and with the procedures for the isolation and control of zoonotic pathogens.
Specific considerations with regard to working with rodents, bats and non-human primates are discussed below:

Rodents

Wild rodents have the potential to carry a variety of zoonotic bacteria and viruses that can be passed on to those handling them. Because of the serious consequences of becoming infected, personnel must always follow good personal hygiene and animal handling procedures and use the provided PPE to protect against exposure.

Special Precautions:

- Wear the minimum PPE for handling rodents as specified in the PREDICT PPE Use Guide, this includes an N95 mask, eye-protection, gloves and coveralls, or clean dedicated clothing.
- Personnel who are handling animals should be immunized against rabies virus according to the World Health Organization and CDC recommendations.

Bats

Exposure to wild bat roosts (in caves or trees), handling of bats in the field or handling bat excreta (urine or feces) presents a potential for exposure to zoonotic pathogens. Rabies, Nipah virus, Ebola virus, and the fungal disease histoplasmosis are examples of zoonotic pathogens carried by some bat species. Bat bites, scratches and wound and mucous membrane exposure to bat saliva are the ways in which rabies can be transmitted. Spores of histoplasmosis can be present in soil and debris enriched with bird and bat droppings. When this dry soil is disturbed, spores can become airborne and cause infection by inhalation.

Special Precautions:

- When working around bats in enclosed spaces, such as in a cave, wear at a minimum an N95 respirator, goggles, gloves and Tyvek coveralls (or dedicated long-sleeved clothing).
- Personnel who are handling animals such as bats should be immunized against rabies virus and be aware of appropriate post exposure prophylaxis in the case of bites according to World Health Organization and CDC recommendations.

Non-Human Primates

Non-human primates may be infected with a number of potentially serious zoonoses. For example, all macaque monkeys and their fluids should be considered to be infected with **Herpes Simian B virus**. Marmosets, although they do not carry the herpes B virus, can carry other disease agents that affect humans such as lymphocytic choriomeningitis virus and *Trypanosoma cruzii*, the cause of Chagas' disease. It is critical that work with non-human primates be done while wearing the appropriate personal protective equipment and with the well-established safe protocols and procedures.

Special Precautions:

- Personnel must follow strict hygiene procedures. Frequent and thorough hand washing, although too often overlooked by the staff, is critical to physically remove bacterial contamination and prevent ingestion exposure.
- PREDICT personnel must wear the minimum PPE for handling non-human primates as specified in the PREDICT PPE Use Guide. This includes an N95 mask, eye-protection, gloves and coveralls or clean dedicated clothing.

Biosafety Levels and Practices

General

All laboratories handling biological agents must post signage indicating that the site is a potential biological hazard area, and identifying all agents in use. Supervisors shall ensure that employees are informed of biological hazards and that suitable biosafety controls are in place. Country Coordinators and lab and field supervisors managing surveillance and other field and laboratory activities should ensure that appropriate biosafety practices are implemented by personnel. Biological safety cabinets are to be certified annually.

It is important to know the biosafety level of the disease that you are working with before beginning work, so that the correct precautions can be taken.

Note: All samples collected for the PREDICT project are to be handled in a Class II Biosafety Laboratory.

Basics of Biosafety Level 1

Biosafety Level 1 (BSL1) practices represent a basic level of containment that relies on standard microbiological practices and basic safety equipment and lab design for laboratories that work with defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy adult humans. However, many agents not ordinarily associated with disease processes in humans are opportunistic pathogens and may cause infection in the young, the aged, and immuno-deficient or immunosuppressed individuals.

BSL-1 Standard Microbiological Practices

1. Access to work areas is limited at the discretion of the supervisor.
2. Hands must be washed after handling biological materials, removing gloves, or before leaving the laboratory.
3. No eating or drinking is allowed in the laboratory.
4. Only mechanical devices are used for pipetting.
5. Safety devices such as self-protected injection syringe or non-sharps should be used as an alternative to sharps. Sharps used should be handled and disposed of properly.
6. Activities that are likely to create splashes, sprays, or aerosols should be minimized.
7. Work surfaces should be decontaminated with 10% bleach (70% ethanol for metal surfaces) at least daily (before and after work with infectious samples) and after any spills.
8. Waste materials should be disposed of properly.
9. Secondary containment should be used when transporting bio-hazardous materials outside of the laboratory. Avoid public areas during transport.

BSL-1 Safety Equipment (Primary Barriers)

1. BUTTONED lab coats should be worn to protect street clothes.
2. Barrier (preferably non-latex) gloves should be worn, particularly if hands have broken skin or a rash.
3. Appropriate eye/face protection (safety goggles as a minimum) should be worn if splashes or sprays are anticipated, or if wearing contact lenses during lab work.

BSL-1 Laboratory Facilities (Secondary Barriers)

1. The lab should have a sink for hand washing.
2. The lab should have an eye wash station.
3. The lab should have a door for access control.
4. The lab fixtures and floors should be easily cleaned and disinfected (no carpets or rugs); bench tops are to be impervious to water and resistant to both moderate heat and the chemicals used to decontaminate the work surface and equipment.

Note: BSL-1 is NOT APROPRIATE for PREDICT samples.

Basics of Biosafety Level 2

Biosafety Level 2 is more restrictive than BSL-1 and is suitable for work involving agents of moderate potential hazard to personnel and the environment. All PREDICT samples are to be handled in a Biosafety level 2 laboratory. It differs in that (a) laboratory personnel have specific training in handling pathogenic agents and are directed by trained technologists, (b) access to the laboratory is limited when work is being conducted, (c) extreme precautions are taken with contaminated sharp items, and (d) certain procedures in which infectious aerosols or splashes may be created are conducted in biological safety cabinets or other physical containment equipment. **All PREDICT samples are to be handled in Class II biological safety cabinets, in Biosafety level 2 laboratory.**

BSL-2 Standard Microbiological Practices

1. Personnel must wash their hands after they handle viable materials, after removing gloves, and before leaving the laboratory.
2. Eating, chewing gum, drinking, smoking, handling contact lenses, and applying cosmetics should not be permitted in the laboratory. Persons who wear contact lenses in laboratories should also wear goggles or a face shield. Food should be stored outside the work area in cabinets or refrigerators designated for this purpose only.
3. Only mechanical pipetting devices are used for pipetting.
4. Policies for safe handling of sharps (when non-sharps are not available) should be instituted.
5. All procedures should be performed carefully to minimize the creation of splashes or aerosols.
6. Work surfaces should be decontaminated with 10% bleach (70% ethanol for metal surfaces) at least once a day (before and after working with infectious samples) and after any spill of viable material.

7. All cultures, stocks, and other regulated wastes are disposed of in the biohazard trash by placing them in a durable, leak-proof container, closed for transport from the laboratory, and transferred to the designated receptacle for disposal. Materials to be decontaminated at off-site locations from the laboratory should be packaged in accordance with applicable local, state, and federal regulations, before removal from the facility.

BSL-2 Special Practices

1. Access to the laboratory is limited or restricted by the laboratory supervisor when work with infectious agents is in progress. In general, persons who are at increased risk of acquiring infection, or for whom infection may be unusually hazardous are not allowed in the laboratory. Persons who are immuno-compromised, immunosuppressed, pregnant or at higher risk of acquiring infections, should not be permitted in the laboratory.
2. The laboratory director establishes policies and procedures whereby only persons who have been advised of the potential hazard and meet specific entry requirements (e.g., immunization) enter the laboratory.
3. Laboratory personnel receive appropriate immunizations or tests for the agents handled or potentially present in the laboratory (e.g., hepatitis B vaccine or TB skin testing).
4. A high degree of precaution must always be taken with any contaminated sharp items, including needles and syringes, slides, pipettes, capillary tubes, and scalpels.
    - Only needle-locking syringes or disposable syringe-needle units (i.e., needle is integral to the syringe) are used for injection or aspiration of infectious materials. Used disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal; rather, they must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal. Non-disposable sharps must be placed in a hard-walled container for transport to a disposal area.
    - Broken glassware must not be handled directly by hand, but must be removed by mechanical means such as a brush and dustpan, tongs, or forceps. Containers of contaminated needles, sharp equipment, and broken glass should be decontaminated with 10% bleach before disposal, according to any local, state, or federal regulations.
5. Cultures, tissues, or specimens of body fluids are placed in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping.
6. Laboratory equipment and work surfaces should be decontaminated with an appropriate disinfectant (such as 10% bleach) on a routine basis, before and after work with infectious materials is finished, and especially after overt spills, splashes, or other contamination by infectious materials. Contaminated equipment must be decontaminated according to any local, state, or federal regulations before it is sent for repair or maintenance or packaged for transport in accordance with applicable local, state, or federal regulations, before removal from the facility. Bleach (10%) can be used on all non-steel surfaces; however, 70% ethanol or other recommended disinfectant should be used when those chemicals are not available.

7. Spills and accidents that result in overt exposures to infectious materials should be reported immediately to the laboratory director. Medical evaluation, surveillance, and treatment should be provided as appropriate and written records should be maintained.

BSL-2 Safety Equipment (Primary Barriers)

1. **Properly maintained biological safety cabinets, Class II,** and other appropriate personal protective equipment or physical containment devices **should be used**.

Procedures with a potential for creating infectious aerosols or splashes are a hazard. These may include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, opening containers of infectious materials whose internal pressures may be different from ambient pressures, inoculating animals, and harvesting infected tissues from animals, eggs or cell cultures.

2. Face protection (goggles, mask, face-shield or other splatter guards) should be used for anticipated splashes or sprays of infectious or other hazardous materials to the face, when the microorganisms must be manipulated outside of the biosafety cabinet.
3. Protective laboratory coats, gowns, smocks, or uniforms designated for lab use should be worn while in the laboratory. This protective clothing should be removed and left in the laboratory before leaving for non-laboratory areas (e.g., cafeteria, library, administrative offices). All protective clothing should be disposed of either in the laboratory or laundered by the institution; it should never be taken home by personnel.
4. Gloves (nitrile or latex) should be worn when hands may contact infectious materials, contaminated surfaces or equipment. Wearing two pairs of gloves may be appropriate, if a spill or splatter occurs; the hand will be protected after the contaminated glove is removed. Gloves should be removed and disposed of when contaminated, removed when work with infectious materials is completed, and should not be worn outside the laboratory. Disposable gloves are not washed or reused.

BSL-2 Laboratory Facilities (Secondary Barriers)

1. Each laboratory should contain a sink for hand washing.
2. The laboratory is designed so that it can be easily cleaned and disinfected. Rugs in laboratories are not appropriate, and should not be used because proper decontamination following a spill is extremely difficult to achieve.
3. Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.
4. Laboratory furniture is sturdy, and spaces between benches, cabinets, and equipment are accessible for cleaning.
5. An eyewash facility is readily available.
6. The laboratory should be at negative pressure with respect to areas outside the lab. Hoods and biosafety cabinets should be positioned away from doors, supply vents and air conditioner airflow.

Biosafety Level 3

Biosafety Level 3 is applicable to working with indigenous or exotic agents, such as brucella and tuberculosis, that may cause serious or potentially lethal disease through the inhalation route of exposure. Laboratory personnel must receive specific training in handling pathogenic and potentially lethal agents, and must be supervised by scientists competent in handling infectious agents and associated procedures. All procedures involving the manipulation of infectious materials must be conducted within a BSC (preferably Class II or Class III), or other physical containment devices. A BSL-3 laboratory has special engineering and design features.

Biosafety Level 4

Biosafety Level 4 is required for work with dangerous and exotic agents, such as Ebola, that pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening disease that is frequently fatal, for which there are no vaccines or treatments, or a related agent with unknown risk of transmission. Agents with a close or identical antigenic relationship to agents requiring BSL-4 containment must be handled at this level until sufficient data are obtained either to confirm continued work at this level, or re-designate the level. Laboratory staff must have specific and thorough training in handling extremely hazardous infectious agents. Laboratory staff must understand the primary and secondary containment functions of standard and special practices, containment equipment, and laboratory design characteristics. All laboratory staff and supervisors must be competent in handling agents and procedures requiring BSL-4 containment. The laboratory supervisor in accordance with institutional policies controls access to the laboratory.

Section 6.3.5. Medical Monitoring

The major purpose of medical monitoring is the early detection of disease or conditions for which treatment can prevent further illness. Medical monitoring is conducted to evaluate exposure to human and zoonotic diseases and unanticipated adverse health effects of exposure. It can also be a valuable tool for hazard control to monitor if initially effective control or work practice has lost effectiveness, or by detecting previously unknown exposures.

Medical consultations should take place:

- Whenever an injury occurs, such as a needlestick, or splash with contaminated material.
- Whenever an employee develops symptoms of exposure to a hazardous chemical or biological agent to which the employee may have been exposed in the laboratory.
- Whenever a spill, leak, explosion, or other occurrence results in the likelihood of an overexposure to a hazardous chemical or biological agent.
- When an employee requests a medical consultation due to health concerns related to assigned tasks and/or change in personal medical history, such as pregnancy, special medications, diagnosed hypersensitivities or other illnesses.
- When exposure monitoring results trigger medical surveillance requirements or when other regulations mandate medical consultations, such as for the use of respiratory protection.

Section 6.3.6. Medical Waste Management

Safe Sharps Disposal

The term "sharps" refers to any object that can cut or puncture the skin including, but not limited to, needles (hypodermic and suture), scalpels, lancets, broken vials or glass, broken capillary tubes, slides and coverslips, and exposed ends of contaminated wires. The primary cause of occupational exposure to blood-borne pathogens in field and laboratory personnel is injury from needlesticks or other sharp objects. At least 20 pathogens are known to have been transmitted following percutaneous exposure to blood. Infections with each of these pathogens are potentially life threatening – and preventable.

How to prevent sharp injuries:

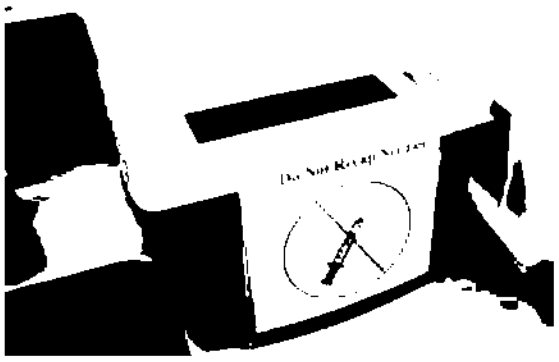
- Do not bend, break, or cut sharps. Shearing or breaking of needles is prohibited.
- Concentrate on what you are doing and do not get distracted.
- Dispose of all sharps in an approved puncture-resistant container as soon after use as possible.
- Ensure this container is placed in the area where sharps are used.
- Ideally, needle and syringe should be disposed as one unit if possible. If a needle must be removed follow the directions on the **Removal of the syringe needle** section above.
- Do not recap needles unless absolutely necessary. If recapped, never use two hands, instead use the one-hand "scoop" technique (see **Removal of the syringe needle** section above).
- Do not overfill sharps disposal container. Seal the container and replace when it is ¾ full.
- Do not empty sharps containers. Dispose of whole container as one unit.
- Wear utility gloves when disposing of medical waste including sharps containers.
- To prevent sharp injuries during transport of medical waste, use a puncture-proof container that remain closed.

Sharps Disposal Containers

Never discard needles and sharps in waste bags, as personnel might be injured when they handle the bags.

Sharp containers are available commercially or can be adapted from some containers that comply with minimal safety standards.

Commercial sharp disposal container boxes)



Non-commercial sharp disposal containers (safety

There are four major criteria for sharps disposal container safety performance, functionality, accessibility, visibility, and accommodation:

Functionality: Containers should remain in a good state during their entire usage. They should be leak-resistant on their sides and bottoms and puncture-resistant until final disposal. Individual containers should have adequate volume and safe access to the opening.

Accessibility: Containers should be accessible to all workers who use, maintain, or dispose of sharp devices. Containers should be placed in all areas where sharps are used and, if necessary, be portable within the workplace or for fieldwork. Portable containers must have a lid to prevent spills and injuries during transport or while working in the field.

Visibility: Containers should be plainly visible to the workers who use them. Workers should be able to see the warning labels and the degree to which the container is full.

Accommodation: Container designs should be convenient, environmentally sound, and easy to store.

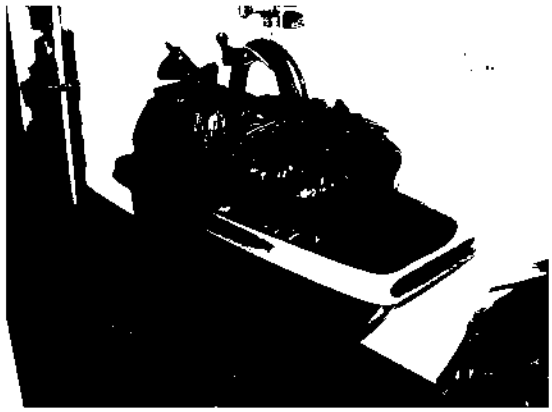
Medical Waste Disposal

Biological waste includes human and animal tissues, fluids and animal carcasses. These are generated along with the sharps and other biologically contaminated equipment that typically need to be discarded in all laboratories (e.g. pipette tips, gloves).

Animal carcasses should be bagged, sealed, and stored in freezers located in the facility until pick up for incineration.

All other biologically contaminated material should be placed in a red bag-lined medical waste box. When the medical waste box is full, it is the responsibility of the field and laboratory personnel to seal the bag, seal the box, and apply a label that contains information about the generating lab.

Medical waste container appropriate for storing and transporting biological waste



Inappropriate container and method for storing and transporting biological waste

Section 6.3.7. Special Chemical Storage and Handling Practices

Laboratory chemical storage and handling hazards can be effectively managed if you:

- Maintain good inventory control and purchase/use the least amount possible.
- Label all stored and in-process chemicals clearly and completely.
- Adopt safe handling practices.
- Use secondary containment and practice your spill response plan.
- Segregate incompatible chemicals and store them in separate appropriate cabinets or cold-storage.
- Develop special controls for highly hazardous materials.

Inventory Control

- Purchase chemicals only in the quantities needed and in containers of the smallest practical size. Although the cost may be higher, significant savings will be gained by reduced hazardous waste disposal or clean-up costs.

- Inventory your chemical supplies at least annually and actively share or distribute excess stocks with other departments to minimize waste. Dispose of all unused and outdated chemicals through appropriate hazardous waste programs.
- Products that could also be purchased for home use, such as soap, oil, or cleaning sprays, should be part of your chemical inventory and have an MSDS on file if the product will be used in an occupational setting and could cause a health exposure in the workplace.
- Before laboratory personnel leave the laboratory, all leftover chemicals should be inventoried and distributed or disposed of.

Labeling

Personnel should ensure that labels on containers of hazardous chemicals are not removed or altered, particularly the manufacturer's original label. Empty chemical containers must never be reused for another purpose, even if the labeling is changed as reactions with new liquid and residual chemical could be extremely dangerous. All bottles, containers, and other apparatus containing chemicals should be accurately and clearly labeled as to contents, hazards, and where practical, the appropriate precautions required when handling the chemical.

Avoid the use of grease pencils or other markers that will wear off.

There are three levels of complexity to labeling: original container, secondary transfer containers, and small container (vials, flask, beakers) for immediate, same-day use.

1. The manufacturer's original labels must contain the following information:
    - Name of chemical or solution
    - Manufacturer name and emergency telephone number
    - Hazard warning (health effect or target organs)

    When opening you must add:
    - Date received and opened
    - Initials

2. For laboratory-prepared solutions and when chemicals are transferred to secondary containers not intended for immediate use, labels should include:
    - Name (no abbreviations) of the chemical and its concentration.
    - For prepared solutions or any secondary containers: initial and date prepared.
    - Hazard warning on the most serious health or safety hazard posed (consult MSDS). Stickers can be applied indicating "corrosive," "carcinogen," "water-reactive," "flammable," etc.
    - If special precautions are critical, expand the hazard warning to include the target organ and the required protection (e.g., "Corrosive, esp. to skin and eyes. Use gloves and goggles").

3. Containers for immediate (same-day) use should have:
    - Chemical name and its concentration
    - Date
    - Initials

Safe Handling and Transfer

Hand-carried chemicals should be placed in unbreakable secondary containers such as bottle carriers or acid-carrying buckets. Wheeled carts used to transport chemicals should have side guards and lipped surfaces capable of containing a break, and sturdy wheels that move easily over uneven surfaces.

Staff should wear protective aprons, gloves, goggles and closed-toed shoes when transporting chemicals.

Class I flammable liquids (any liquid having a flash point below 37.7°C should not be stored or transferred from one vessel to another in an exit access corridor, open plan building, or in an ancillary space unprotected from the exit access corridor.

Transfer of Class I liquids to smaller containers from bulk stock containers not exceeding 5 gallons in capacity should be performed in a laboratory hood, in an area provided with ventilation adequate to prevent accumulations of flammable vapor exceeding 25% of the lower flammable limit, or within an inside liquid storage area approved for dispensing.

Class I liquids should not be transferred between conductive containers of greater than 1.1 gallons, unless the containers are bonded and grounded (the process of providing an electrically conductive pathway - usually by clipping connecting wires - between a dispensing container and a receiving container [bonding], and the receiving container and an earth ground).

Secondary Containment and Spill Control

Liquid chemicals should be stored in corrosion-resistant trays or on spill pallets or other secondary containment to contain a break or leak.

Concentrated acids and bases should be stored in acid or caustic storage cabinets. If possible, keep corrosives stored in their original (e.g. Styrofoam cubes) shipment containers.

In the event of a chemical spill, try to turn off all reaction apparatus, especially heat sources, notify supervision immediately and follow the response steps in your facility.

Cabinet and Shelf Storage – General Precautions

Cabinets and other storage areas should be marked with the general class of chemical stored, and any other pertinent warnings.

Storage areas should have good general ventilation and be well lighted.

On shelves, containers should be staggered for easy access, with labels facing out. DO NOT ALPHABETIZE STORED CHEMICALS; SEPARATE BY COMPATIBILITY (see next section).

Heavy and large containers are to be placed on bottom shelves. Chemicals, especially liquids, should be stored below eye level. Larger containers should be stored on lower shelves. Exposure to heat or direct sunlight should be avoided. Avoid storing chemicals on the floor unless in approved shipping containers. Minimize open shelf or bench top storage, except for those chemicals currently being used, to prevent accidental spills and reduce the risk of fires.

Cabinets specifically for corrosives (either acids or bases) should have corrosion-resistant paint. Flammable storage cabinets should provide an airtight seal; vent holes should be kept covered and flame-arrestor kept in place.

Oxidizers MUST be stored in separate cabinets from flammables and combustibles. Oxidizers, explosives, and organic peroxides must be separated from combustibles and placed in a metal cabinet, or in an approved dry, cool, and well-ventilated location.

If acids and bases must be stored together in the same cabinet, place each in separate secondary containers (non-reactive trays) on opposite sides of the cabinet to minimize intermingling in case of a spill or drip (in other words, do not store all the acids on one shelf, and all the bases on the shelf below).

Initially assign each chemical to broad hazard classes, for example: flammable, corrosive (acids and bases), reactive oxidizer or reducer, special hazard (air/water reactive, peroxide forming chemical, store at reduced temperature or under an inert atmosphere, highly toxic).

Chemicals that possess more than one hazard (i.e., oxidizer and corrosive) are assigned to the class that represents the greater hazard for that laboratory.

Post incompatibility lists (from your MSDSs) for reference.

Hazardous chemicals should be disposed of in clearly labeled containers, and as with storage, separated by class. For example, acids should not be disposed of with bases but should be separated. The same is true for corrosives and flammables.

Refrigerators and Freezers – Flammable Storage

All refrigerators or freezers should be distinctly marked as to whether they are suitable for the storage of flammable liquids.

Standard household-variety refrigerators should not be used to store flammable liquids.

Flammable liquids stored in refrigerated equipment should be in closed containers.

Storage of Chemicals by Class

Flammables and Combustibles

Flammables are chemicals that have a flash point less than 37°C (100°F). Combustible chemicals have flash points that are 37-93°C. If stored or used improperly, flammables and combustibles can be a fire hazard.

Examples of flammable liquids include benzene, alcohols, acetone, ethers, organic acids (i.e., glacial acetic acid).

The quantity of flammable/combustible hazardous chemicals within a laboratory unit or in a laboratory work area, that is stored in the open, shall be limited to the minimum necessary to perform required tasks.

Bulk supplies of alcohol (such as 95% EtOH in drums) should be stored in an approved flammable liquids storage room.

To the greatest degree possible, the storage of flammable liquids in a laboratory work area, outside of an approved flammable liquids cabinet, or storage room should be limited to what is needed for a single day's use. Otherwise, flammable liquids should be stored within an approved flammable liquids cabinet when not in use.

Corrosives: Acids

Acids are corrosive and react violently with bases. There are two main groups of acids: organic acids, and inorganic (mineral) acids. Some inorganic (mineral) acids are oxidizers and will react with organics, increase burning rate of combustibles and contribute an oxygen source to a combustion reaction. Therefore, inorganic (mineral) acids should be stored separately from organic acids.

Examples of inorganic OXIDIZING acids: perchloric acid (particularly dangerous at elevated temperature), chromic acid, nitric acid, sulfuric acid (particularly dangerous at elevated temperature).

Examples of inorganic MINERAL acids: hydrochloric acid, hydrofluoric acid, phosphoric acid.

Examples of organic acids: acetic acid, formic acid, butyric acid, propionic acid, picric acid, acrylic acid.

Oxidizing inorganic acids should be segregated from organic acids, flammable and combustible materials. Most mineral acids can be stored together, except perchloric acid (see below):

Nitric acid shall be stored separate from other acids.

Segregate acids from bases and active metals such as potassium and magnesium.

Segregate acids from chemicals that could generate toxic gases upon contact, such as sodium cyanide.

Segregate acids from solvents such as toluene and xylene.

Organic acids (e.g., glacial acetic acid) are combustible and should be stored separately or with flammables rather than with inorganic acids. Several inorganic acids are oxidizers and are therefore incompatible with organics.

Corrosives: Bases
Bases are corrosive and react violently with acids.

Examples: ammonium hydroxide, sodium hydroxide, calcium hydroxide, organic amines.

Segregate bases from acids. Bases are also corrosive to skin and tissue. Pay meticulous attention to PPE when using bases.

Reactive: Oxidizers
Oxidizers react vigorously with reducing materials. The reaction can lead to fires or explosions. Oxidizers will increase the burning rate of combustible materials and contribute oxygen to a combustion reaction.

Examples: halogens, ammonium persulfate, hydrogen peroxide, sodium dichromate, potassium permanganate, perchloric acid; at elevated temperature, ammonium nitrate (and other nitrate salts).

Keep oxidizers away from flammables, combustibles (such as paper, wood) and other reducing agents.

Reactive: Reducers
Reducing materials react vigorously with oxidizers. The reaction can lead to fires or explosions.

Examples: ammonia, carbon, metals, metal hydrides, phosphorus, silicon, sulfur.

Store reducing materials away from oxidizers.

Water-reactive Chemicals
Water reactive materials react with water, water solutions, moisture, or humidity in the air to produce heat and/or flammable gases, which can ignite.

Examples: sodium (elemental), potassium (elemental), calcium carbide, phosphorous pentachloride.

Store water reactives away from any sources of water or moisture. Review manufacturer's recommendations for special storage conditions, such as under an inert atmosphere or, as in the case of elemental sodium, under mineral oil.

Peroxide Forming Chemicals

Potentially explosive peroxides are formed by a free-radical reaction of hydrocarbons with molecular oxygen. Distillation, evaporation or other concentration of the peroxide can cause an explosion in contaminated hydrocarbons.

Examples: diethyl ether, tetrahydrofuran, acetaldehyde, isopropyl ether.

Store peroxide-forming chemicals away from light and heat. Carefully label all containers with the date received and the date opened. Monitor container dates and avoid keeping peroxide-forming chemicals on hand for more than a year after receipt and 6 months after opening.

Highly Hazardous Chemicals

Highly hazardous chemicals are defined as chemical carcinogens, reproductive toxins, acutely toxic substances, and highly reactive materials (ex. Ethidium bromide used in molecular laboratories).

Designate a Restricted Work Area. Conduct all transfers and work with these substances in a "controlled area" (i.e., a restricted access hood, glove box, or portion of a lab designated for use of highly-toxic substances) for which all personnel with access are aware of the substances being used and the necessary precautions that must be taken. Only trained and authorized personnel should work in or have access to controlled areas.

Signs and labels. Assure that the controlled area is conspicuously marked with restricted access and warning signs, such as, "WARNING: Highly-Toxic Substance in Use: Authorized Personnel Only" or "WARNING: Cancer-Suspect Agent: Authorized Personnel Only." All containers of these substances must be appropriately labeled with identity and warning such as, "Warning: High Chronic Toxicity or Cancer Suspect Agent."

Storage. Store containers of these chemicals in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.

Establish Decontamination Procedures. The need for routine decontamination of designated work area, equipment, or personnel depends on the laboratory circumstances.

Medical surveillance. When using a highly toxic substance on a regular basis (e.g., 3 times per week), consult with your supervisor concerning medical surveillance or other health concerns you may have.

Cleanup and Waste Disposal. Use chemical decontamination whenever possible. Use a vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter, instead of dry sweeping

when the toxic substance is a dry powder. A wet mop may also be used when the chemical is not water reactive or otherwise incompatible with water. Ensure that all vacuum filters, bag debris, mop heads or cleaning rags, as well as waste chemicals are transferred from the designated control according to a hazardous waste disposal container. Ensure that contingency plans, equipment, and materials are available to minimize exposures to personnel and property in the event of an accident. Do not ask/expect custodial staff to clean hazardous materials spills, unless they are already members of the facility's trained response team.

Hazardous Waste Disposal and Spill Control

Each container of hazardous waste is to be labeled with the following legends:

"HAZARDOUS WASTE"
Contents (be specific as to chemical):
Accumulation start date:

If a reagent container label has been removed or becomes illegible, and the identity of the contents is unknown, the container must be disposed of as soon as possible by arrangement with the facility hazardous waste coordinator.

Prior to the departure of staff, chemicals for which that person was responsible should be inventoried and discarded or returned to storage.

Pouring hazardous waste chemicals down the drain, adding them to regular trash, or evaporating them in a local exhaust hood could be illegal actions!

Section 6.3.8. Training in Basic Laboratory Procedures and Protocols

Training and education in laboratory safety need to be an ongoing process, not just an annual presentation. The most effective way to reinforce good work practices is to involve all personnel from principal researchers to volunteers in regular, periodic reviews and updates of this Basic Laboratory Safety Guide. Documentation of all forms of training is to be maintained in the laboratory as well as reported to the facility safety coordinator.

INITIAL BASIC LAB HAZARD AWARENESS TRAINING **is mandatory for all staff** and must be provided to all employees doing field and laboratory work prior to actual lab and field work, and prior to assignments involving new potential exposures. Information provided during trainings should include:

The location and availability of the Laboratory Safety Plan, chemical inventory, Material Safety Data Sheets (MSDSs), applicable regulatory exposure limits, and other reference material regarding the safe handling, storage, and disposal of hazardous chemicals (or hazardous collections) in the lab.

Signs and symptoms associated with exposures to hazardous chemicals and biological agents used in the laboratory, as well as the health hazards themselves.

Methods that may be used to detect the presence or release of a hazardous chemical. This could include industrial hygiene monitoring, the use of continuous monitoring devices, visual appearance, or odors of chemicals.

Methods employees can take to protect themselves from hazards, including work practices, personal protective equipment and emergency procedures listed in the LSP. This should include a discussion of the proper use and limitations of engineering controls and safety devices, including chemical and biological hoods.

Emergency response plans established by each facility's Emergency/Disaster Response Plan, any medical or first aid response specifically recommended, extinguishment of clothing fires (Stop, Drop, and Roll), and Chemical Spill Response Plans established by each facility.

Section 6.3.9. Basic Standards and Guide Checklists

- ☐ Coordinators should provide a "Useful Contacts" list with address and numbers of local medical and emergency response services.
- ☐ Personnel should know the locations of the emergency supplies (fire extinguishers, first aid kits, spill kits, safety showers and eye wash stations), phone numbers of supervisor and exits.
- ☐ Coordinators must verify that a Material Safety Data Sheet (MSDS) for each product to be used during PREDICT activities is readily available, complete and updated.
- ☐ Personnel should know where the MSDSs are located.
- ☐ Coordinators must ensure that personnel have read and understood the MSDS before using a chemical product
- ☐ Coordinators must have MSDS data available for emergency responders.
- ☐ Individuals that have been exposed to any hazardous chemical or biological agent should immediately report the exposure to medical authorities and supervisor.
- ☐ A complete list with the contents of the PPE kit should be available to the personnel.
- ☐ Personnel should wear appropriate PPE (lab-coat, protective glasses, gloves, closed toed shoes) for laboratory procedures.
- ☐ Inspect your PPE to ensure that it is in proper working condition before use (goggles, gloves, etc.).
- ☐ If you are working with PPE kits, ensure that the kit is stocked and material has not expired.
- ☐ Personnel must use a chemical, fume or laminar flow hood when indicated.
- ☐ All needles, scalpel blades and any other sharp instruments should be used and disposed of in a manner that prevents accidental human injury.
- ☐ All stored and in-process chemicals should be labeled clearly and completely.
- ☐ Segregate incompatible chemicals and store in appropriate cabinets or special cold-storage.
- ☐ Develop special controls for highly hazardous materials.
- ☐ Purchase chemicals only in the quantities needed and in containers of the smallest practical size.
- ☐ Inventory your chemical supplies at least annually and actively share or distribute excess stocks with other departments.
- ☐ Dispose of all unused and outdated chemicals through appropriate hazardous waste programs and NOT down the drain or by adding them to regular trash.
- ☐ Sinks and eye wash stations should be kept clear and in proper working condition.
- ☐ Staff should wash their hands and forearms after they have removed and disposed their PPE or after removing gloves.
- ☐ Food and beverages are NOT allowed in any of the labs.
- ☐ Report any lab failure (equipment, facilities, etc.) to the supervisor.
- ☐ Staff should keep BUTTONED lab coats at all times when working in the laboratory.
- ☐ All human and animal tissues, fluids and excrement should be handled in a Class II Biosafety Cabinet so that the potential for human exposure is minimized.
- ☐ Specific Biosafety levels 1 and 2 practices should be followed by personnel as warranted.
- ☐ Personnel must be familiar with hazard controls and safe operating procedures.

Section 6.3.10. List of Equipment and Supplies

- [ ] Lab-coat
- [ ] Nitrile gloves ideal, latex if not available
- [ ] Face-mask
- [ ] Goggles
- [ ] Face-shield
- [ ] Closed toed shoes
- [ ] Disposable (Tyvek) suit
- [ ] Sharp-container
- [ ] Medical waste box
- [ ] Respirator
- [ ] PPE Kits or Supplies
- [ ] Eyewash station
- [ ] Liquid nitrogen gloves

Section 6.3.11. References

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Section 4. Biosafety and Personal Protective Equipment (PPE) Use

Prepared by
Terra Kelly, UC Davis
Matthew LeBreton, Metabiota
and the PREDICT One Health Consortium.

Objective: To provide principles and general guidelines for the use of Personal Protective Equipment (PPE) to prevent exposure to and transmission of infectious pathogens during PREDICT activities.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Biosafety and Personal Protective Equipment (PPE) Use.

Table of Contents: Biosafety and Personal Protective Equipment (PPE) Use

*Adapted from the *USAID STOP-AI Training Module: Introduction to PPE*

Section 4.1. Learning Objectives and Confirmation

After studying this guide, you will be able to:

- Implement basic biosafety precautions.
- Describe the factors to consider when assessing the biological risk of handling animals and collecting human and animal samples, and other field and laboratory activities that may have potential risk for zoonotic disease exposure.
- Understand factors to consider when choosing appropriate PPE based on identified risks.
- Identify and describe the functions of each component of PPE.
- Correctly put on and take off appropriate PPE for PREDICT sample collection and handling activities in a non-outbreak setting. For collecting samples from hospital and clinic patients and during disease outbreaks, specific PPE components and procedures to put on and take off PPE should be adapted based on the determined risk level.
- Describe the importance of respirator fit and fit testing.

Confirm you understand the material of this guide:
When you are familiar with the information in this guide, take the PREDICT quiz in ***Section 8.4.3. Biosafety and PPE Use***.

Section 4.2. Biosafety Overview

Personal Safety Responsibilities

- Individuals have the primary responsibility for their own health and safety. Nothing substitutes for good training and vigilance.
- Follow safety procedures outlined in PREDICT protocols regarding each activity that involves potential exposure to infectious pathogens.
- Use appropriate safety equipment.
- Report unsafe or hazardous situations, injuries, and accidents immediately to your supervisor or instructor.
- Report any illness to your PREDICT supervisor.
- Participate in required safety training.

Follow PREDICT waste disposal procedures (see ***Basic Laboratory Safety (Section 6.3.)*** *and* ***Safe Disposal of Carcasses and Infectious Waste Guide (Section 2.5.)***) consistent with the ***PREDICT Environmental Mitigation and Monitoring Plan (Section 2.4.)***.

Responsibilities of the Country Coordinator and Field Supervisors

- Provide and document training for all personnel who will participate in PREDICT project activities.
- Ensure compliance with relevant PREDICT or organizational task protocols.
- Ensure compliance with the PREDICT Environmental Mitigation and Monitoring Plan.
- Ensure compliance with local permit requirements and regulations.
- Report injuries/accidents and ensure compliance with associated mitigation.
- Ensure that all field personnel are trained on the safe use of field equipment.

General Zoonoses Biosafety Precautions

There is a risk of exposure to pathogens, including zoonotic pathogens, when handling animals, and human and animal samples in the field. Therefore, it is important to implement measures to minimize the risk of pathogen transmission.

The following list of general precautions applies to most situations:

- Inform all who enter potential zoonotic pathogen risk areas of their potential for exposure and the associated risks.
- Review information regarding the zoonotic agents likely to be found in the samples or animals to which you or others may be exposed.
- Wear the appropriate PPE based on protocols for the activity and species and as directed by the Country Coordinator or Field Supervisor.
- Use disposable supplies whenever possible.
- Wash hands and wrists after removing your gloves.
- Don't wear field or lab clothing or shoes outside of work areas where there may be zoonotic pathogen exposure. Change clothing and shoes before getting into your vehicle.
- Launder contaminated protective clothing at work. Don't take your protective clothing home with you.
- Never eat or drink in areas where human sampling, animals, their wastes, or their products (e.g., blood) are present.
- Wash your hands frequently and practice good hygiene. Avoid touching your face while working with animals, human and animal samples, or other sources of pathogens. Although a normal, healthy adult person may have only mild symptoms of a zoonotic disease, that person may unknowingly spread the disease to others. Unfortunately, animal handlers have "carried home" zoonotic pathogens to their infants with fatal consequences. Therefore, good hygiene is not only to protect the person working directly with human and animal samples; but it is also for all persons and animals with whom they have contact.
- When seeking medical advice for any illness, inform your physician of your work with humans and animals.
- Make sure a first aid kit is immediately available during all field and laboratory activities.
- Refer to established procedures for how to respond to a bite, cut, scratch, puncture or other injury that results in possible zoonosis exposure.

- Refer to established procedures for disinfecting all equipment, samples, cages, and traps according to guidance provided below.

Hand Washing - Teach and Practice Good Hand Washing Technique

The importance of hand washing in preventing infection and the spread of infectious pathogens cannot be over emphasized.

Always wash your hands before:

- Putting on PPE for handling animals or collecting or handling human and animal samples
- Contact with a sick or injured person or animal
- Treating wounds or administering medications
- Preparing food
- Eating
- Inserting or removing contact lenses

Always wash your hands after:

- Taking off PPE
- Touching an animal, human and animal samples, waste, products or animal equipment
- Collecting and handling diagnostic samples
- Visiting field sampling sites or clinics/hospitals
- Preparing foods, especially raw meat or poultry
- Using a toilet
- Changing a diaper
- Blowing your nose, coughing or sneezing into your hands
- Treating wounds
- Touching a sick or injured person
- Touching garbage or other potentially contaminated materials
- Finishing work in the laboratory

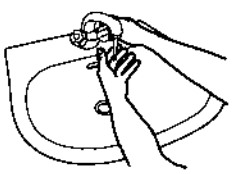
Plan for hand washing:

- Plan for hand washing in the field by identifying any locations with running water near the site and bringing supplies (i.e., water, soap, bucket, paper towels, hand sanitizing gels and germicidal wipes that contain at least 60% alcohol)
- Plan when you will need to wash to ensure supplies are ready and available

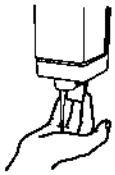
See the WHO guidelines below for proper hand washing technique. If soap and water are not available, use an alcohol-based hand sanitizing gel that contains at least 60% alcohol. These products significantly reduce the number of microbes on the skin and are fast acting. However, they are not effective if hands are visibly dirty. Organic matter and natural oils on hands create a barrier that blocks the effectiveness of the sanitizer. See http://www.cdc.gov/handwashing/show-me-the-science-hand-sanitizer.html for more information.

How to Hand

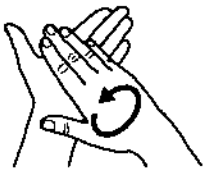
☐ **Duration of the entire procedure:**



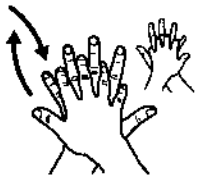
Wet hands with water;



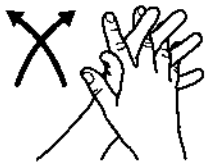
Apply enough soap to cover all hand surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;

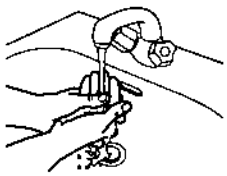


Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;

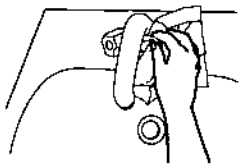
Rotational rubbing of left thumb clasped in right palm and vice versa;

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

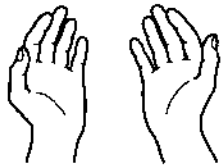


Rinse hands with water;

Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

Disinfection of Surfaces and Materials

Dirt and organic matter can protect microbes from decontaminants (antiseptics, chemical germicides and disinfectants). Therefore, precleaning contaminated surfaces as well as reusable supplies, equipment and PPE is important to achieve proper disinfection. Precleaning should be carried out cautiously to avoid exposure to pathogens.

Contact times for disinfectants are specific to the type of solution and the manufacturer. Therefore, it is important to follow the manufacturers' specifications. Further, solutions used for precleaning and disinfection should be the same or chemically compatible.

There are several types of disinfectants on the market and formulations should be selected for specific needs. High temperatures can degrade chemical disinfectants, so shelf-life may be decreased in areas with high ambient temperatures.

Chlorine bleach or Virkon disinfectant solution are commonly used as general-purpose disinfectants. See the WHO Laboratory Biosafety Manual (http://www.who.int/csr/resources/publications/biosafety/en/Biosafety7.pdf) for frequently used classes of disinfectants, with general information on their applications and safety profiles, as well as recommended dilutions for chlorine-releasing compounds, such as chlorine bleach.

Section 4.3. Assessing Biosafety Risk of Zoonotic Pathogens and Selecting PPE

Key to the practice of biosafety is assessing the risk of infection associated with a specific procedure under specific environmental conditions. There are many considerations in the assessment of risk and it is the job of the supervisor to weigh these considerations to determine the appropriate measures to protect humans and animals from infection.

Factors to Consider when Assessing Biological Risk of Procedures to Determine Necessary PPE

1. Species to be handled and sampled.
2. Pathogens likely to be present in these species/samples.
3. Pathogenicity of these pathogens (see WHO classification of infective microorganisms by risk group below).
4. Potential exposure opportunities and routes of infection for the pathogens given the planned activity.
5. Potential result of exposure to the pathogens.
6. Estimated infectious dose and stability of the pathogens in the environment.
7. Information available in the literature, including animal studies and clinical reports that would help inform on risk.
8. Measures to reduce the risk of exposure, such as sanitary measures (e.g., food and water hygiene) and control of animal reservoirs or arthropod vectors, the movement of people or animals, and the importation of infected animals or animal products.
9. Local availability of effective prophylaxis and treatment. Prophylaxis may include vaccination or antisera. Treatment options may include passive immunization and post-

exposure vaccination, antibiotics, and chemotherapeutic agents, taking into consideration the possibility of the emergence of resistant strains.

Based on the risk assessment considering the factors listed above, the following should be determined by the PREDICT activity supervisor (often Country Coordinators):

1. Hazards and risk of exposure.
2. Appropriate PPE required to implement the activity safely and to prevent transmission of infectious pathogens. (Components of PPE to consider are discussed later in this document).
3. Special procedures, such as disinfection procedures between handling individual animals and people or between site visits, that may be required to reduce risk of transmission and provide adequate protection for humans and animals.
4. Vaccinations or prophylaxis required for PREDICT personnel before the activity.

World Health Organization (WHO) Classification of Infective Microorganisms by Risk Group (2004)

WHO provides the guidelines below for classifying biological risk categories, based on pathogenicity of the organism and modes of transmission and host range of the organism. These primary factors are affected by existing levels of immunity, density and movement of host population (human or animal), presence of appropriate vectors and environmental conditions, and availability of effective preventive measures and treatment. Countries usually adopt a similar set of risk categories. The WHO risk group classification was developed for laboratory work. See **http://www.absa.org/riskgroups/** for more information and a link to the Risk Group Database where information on risk can be obtained for specific microbes and/or microbe families.

The WHO risk categories are:

WHO Risk Group 1 (no or low individual and community risk) -- A microorganism that is unlikely to cause human disease or animal disease.

WHO Risk Group 2 (moderate individual risk, low community risk) -- A pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventative measures are available and the risk of spread of infection is limited.

WHO Risk Group 3 (high individual risk, low community risk) -- A pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available.

WHO Risk Group 4 (high individual and community risk) -- A pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.

Appropriate PPE for PREDICT Activities

While PREDICT field staff will be working in very different environments with varying levels of biological risk, there are some tasks for which **minimum PPE requirements** have been established and detailed in Table 1.

Table 1. Minimum PPE to wear for some PREDICT Tasks:

Taxa/Task	Respirator (N95 or respirator with comparable filtering rating	Goggles, Face shield or protective glasses	Gloves*	PPE Coveralls or Dedicated Clothing with washable shoes
Handling human and animal specimens	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling primates (live or carcass)	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling rodents or bats (live or carcass)	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Sampling in bat caves	Yes	Yes	Yes	PPE coveralls
Sampling or necropsy of sick/dead animals	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing) with apron
Sampling bushmeat	Yes	Yes	Yes	Yes (either PPE coveralls or dedicated clothing) with apron
Handling poultry or waterfowl	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling livestock	Depends**	Depends**	Yes	Yes (either PPE or coveralls or dedicated clothing)
Sampling apparently healthy humans	Depends***	Depends***	Yes	Depends***
Collection of animal feces or urine from the environment	Depends****	Depends****	Yes	Depends****
Sampling an animal once it has been anesthetized	Recommended if in close contact with the animal during sampling activity	Recommended for those in close contact with the animal during sampling activity	Yes	Yes (either PPE or coveralls or dedicated clothing)

Table Definitions

* When handling live animals that pose a bite or scratch risk, it is recommended that leather gloves be worn above nitrile gloves for added protection. Nitrile gloves are more puncture resistant than latex and may reduce the risk of exposure from a bite or scratch. In many cases chemical restraint (anesthesia) is recommended to prevent injury to either the handler or the animal during sample collection.

** It is recommended to use a respirator, full protective clothing and eye protection when in contact with livestock suspected of harboring a biohazardous agent and pregnant livestock or livestock recently giving birth, and upon entering and/or working in abattoir settings or other settings where livestock are being slaughtered and/or butchered.

*** For routine sample collection from apparently healthy people, gloves are recommended. For collecting samples from hospital and clinic patients and during outbreaks, PPE should be adapted based on the determined risk level.

**** In some cases, such as during the collection of urine underneath a colony of fruit bats roosting in trees where there is a high risk of aerosolizing of excreta and microbial agents, then it is recommended to use a respirator (N95 respirator is recommended as the minimum level of protection), full protective clothing and eye protection.

Higher Risk Taxa

Below is a summary of special biosafety considerations for some of the key groups of species (bats, rodents, and non-human primates) to be handled as part of PREDICT activities.

Rodents, bats, non-human primates and other wild species may harbor pathogens that are transmittable to, and highly pathogenic in, humans. When handling these rodents, bats or non-human primates, careful consideration needs to be given to conscientious use of PPE, good personal hygiene (i.e., hand washing), safety training, and application of good animal handling and sampling techniques to minimize exposure to infection or injury.

In the event of an injury while handling animals that pose risk of zoonotic pathogen exposure, appropriate first aid must be applied. The risk of infection can be significantly reduced with immediate and thorough scrubbing of the wound with soap or antiseptic.

Vaccination to prevent rabies infection: Personnel who are handling animals that are known reservoirs for rabies (i.e., bats and dogs) should be immunized against rabies virus according to World Health Organization and CDC recommendations.

Investigators should familiarize themselves with known biohazards specific to species under study and with the procedures for the isolation and control of zoonotic pathogens.

Specific considerations with regard to working with rodents, bats and non-human primates are discussed below:

Rodents

Wild rodents have the potential to carry a variety of zoonotic bacteria and viruses that can be passed on to those handling them. Because of the serious consequences of becoming infected, personnel must always follow good personal hygiene and animal handling procedures and use the provided PPE to protect against exposure.

Special Precautions:

- Wear the minimum PPE for handling rodents including an N95 mask, eye-protection, gloves and coveralls, or clean dedicated clothing.
- Personnel who are handling animals should be immunized against rabies virus according to the World Health Organization and CDC recommendations.

Bats

Exposure to wild bat roosts (in caves or trees), handling of bats in the field or handling bat excreta (urine or feces) presents a potential for exposure to zoonotic pathogens. Rabies, Nipah virus, Ebola virus, and the fungal disease histoplasmosis are examples of zoonotic pathogens carried by some bat species. Bat bites, scratches and wound and mucous membrane exposure to bat saliva are the ways in which rabies can be transmitted. Spores of histoplasmosis can be present in soil and debris enriched with bird and bat droppings. When this dry soil is disturbed, spores can become airborne and cause infection by inhalation.

Special Precautions:

- When working around bats in enclosed spaces, such as in a cave, wear at a minimum an N95 respirator, goggles, gloves and Tyvek coveralls (or dedicated long-sleeved clothing).
- Personnel who are handling animals such as bats should be immunized against rabies virus and be aware of appropriate post exposure prophylaxis in the case of bites according to World Health Organization and CDC recommendations.

Non-Human Primates

Non-human primates may be infected with a number of potentially serious zoonoses. For example, all macaque monkeys and their fluids should be considered to be infected with **Herpes Simian B virus**. Marmosets, although they do not carry the herpes B virus, can carry other disease agents that affect humans such as lymphocytic choriomeningitis virus and *Trypanosoma cruzii,* the cause of Chagas' disease. It is critical that work with non-human primates be done while wearing the appropriate personal protective equipment and with the well-established safe protocols and procedures.

Special Precautions:

- Personnel must follow strict hygiene procedures. Frequent and thorough hand washing, although too often overlooked by the staff, is critical to physically remove bacterial contamination and prevent ingestion exposure.
- PREDICT personnel must wear the minimum PPE for handling non-human primates including an N95 mask, eye-protection, gloves and coveralls or clean dedicated clothing.

Section 4.4. Use and Disposal of PPE

Considerations When Using PPE

Personnel wearing PPE may experience heat stress and general discomfort in hot or humid environments. It is important to remain hydrated by drinking adequate water before and after wearing PPE. Length of time wearing full PPE should be limited, based on environmental conditions, to avoid the risk of heat exhaustion or heat stroke. Personnel should inform their supervisor(s) if they experience severe discomfort during animal capture or sampling activities, so that they may take a break.

When workers are heat-stressed, uncomfortable, or unable to see out of their fogged goggles, they are more likely to remove their goggles or mask in risky environments, exposing themselves to potential pathogens.

Most PPE items to be worn during PREDICT activities are disposable and designed to be used only once, and should be properly disposed of as medical waste after each use. Plastic goggles and rubber boots may be re-used, but must be disinfected between each use.

Designate a clean area for putting on PPE. It should ideally be a clean area away from any potentially contaminated animal equipment, such as cages, crates, or farm tools. All personnel should use this area to put on their PPE. Also, designate a decontamination and PPE removal site.

Always wear the respirator properly when you are working. Ensure that there is a tight seal formed around the mask and never hang it around your neck.

When wearing coveralls, ensure there is no exposed skin between your sleeves and gloves. If any piece of PPE is torn, it should be changed at the PPE decontamination site as soon as possible following the steps outlined in the section on how to take off PPE.

It is beneficial to have a colleague confirm that PPE is properly worn. Working in teams when putting on and removing PPE can help avoid mistakes and react immediately if accidents occur.

Planning and Preparations for PPE Use

1. Prior to going to the field, the level of risk for the field tasks and the appropriate PPE needed to safely perform the field tasks should be determined.
2. PPE kits should be assembled for each person who will be involved in the field tasks. Multiple kits per person may be required, based on the number of animals to be handled, the number of breaks that personnel may take, and to account for potential tears in gloves and coveralls, etc.
3. Prior to going to the field, PPE supplies should be organized. Along with required sets of PPE, supplies should include disinfectants, alcohol-based hand sanitizing gel and germicidal wipes, large color coded bags for infectious waste disposal according to national codification, and collection bags for equipment (such as plastic goggles, face shields and rubber boots) that will be disinfected for re-use.
4. Bottled water should be available for consumption before and after use of PPE. PPE can be very hot, and personnel are more likely to suffer heat stress if they do not consume adequate amounts of water.
5. Bring additional tape and extra collection and disposal bags. Tape can be used to secure shoe covers and protective clothing and seal bags.
6. Plan for disposing of PPE:
    a. An area for removing PPE should be identified. This area should be away from the contaminated area and away from animals. All personnel should use this area to remove their PPE.
    b. Remove all of your PPE carefully, following the recommended steps for PPE removal (below) and discard them (or put reusable items in bags for disinfection) before taking a break. Put on a new set after the break.
    c. Immediately after removing PPE, place it directly into the color coded infectious waste bag (or marked biohazard waste bag).
    d. Color coded infectious waste bags should be sealed and properly disposed. Follow the instructions of the local officials or person supervising the work on where to dispose infectious waste bags when they are full.
    e. Disposal methods (such as burning or burial) may differ by situation or location. Local officials and/or those supervising the work will likely decide on how best to dispose of used PPE and other disposable items that are potentially contaminated. For guidelines, see PREDICT Safety Guide: Laboratory Operations, Environmental Guidelines for Small-Scale Activities in Africa (EGSSAA) Ch. 8: Healthcare Waste: Generation, Handling, Treatment and Disposal (http://www.encapafrica.org/egssaa/medwaste.pdf); and WHO Safe Management of Wastes from Health-Care Activities (**http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/).**

Components of PPE Kits

1. Coveralls, dedicated clothing and shoes, and aprons – for high-risk tasks, full coverage may be warranted. In that case, Tyvek or Tychem coveralls, shoe covers or boots, and an apron may be used. For lower-risk tasks, just an apron and/or dedicated clothing and shoes may be appropriate. An apron should be a disposable type that is properly disposed of together with

gloves and masks after each use. Dedicated clothing (e.g., cotton coveralls) at the work site should be removed and laundered after each use.

Regarding the use of Tyvek or Tychem coveralls:

- Wear these coveralls to protect your skin and/or clothing against contamination when in contact with human samples, animal droppings, dust, animal urine or droppings, or animal fluids such as blood, saliva, and mucous.
- The synthetic material Tyvek is water resistant and Tychem is water proof, so even if the coveralls get dirty or wet, they will offer protection. Tychem offers more protection from liquids and should be considered in situations with high risk of exposure to blood-borne pathogens (e.g., hemorrhagic disease, EVD outbreak investigations).
- You can wear your dedicated shoes and clothing under the coveralls.

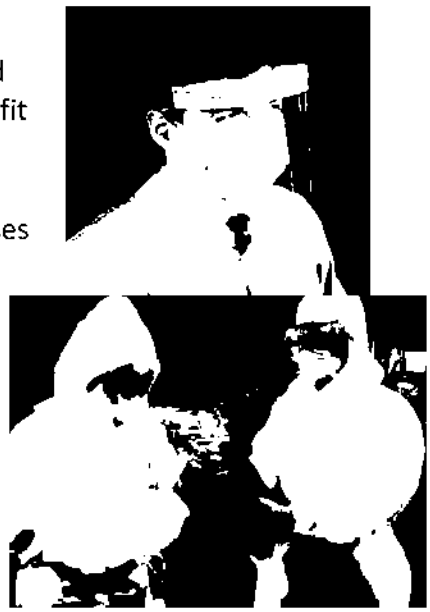
2. Shoe Covers or Washable Rubber Boots

- Because pathogens in human and animal samples including feces, secretions, or blood can easily contaminate your footwear, it is important to have disposable shoe covers or rubber boots that can be disinfected.
- The shoe covers provided in some PPE kits fit over your coverall feet, or over your shoes.
- Rubber boots may be worn with dedicated pants pulled over the top of them. If using PPE coveralls with rubber boots, purchase the coveralls without feet (or cut the feet off) and pull the pant legs of the coveralls over the top of the boots.
    - A footbath should be prepared with either chlorine bleach or Virkon disinfectant. This can be used to disinfect boots and other footwear upon leaving the field site. A boot brush should be available for scrubbing surfaces of footwear prior to using the footbath. It is critical to remove all organic material from footwear prior to disinfection to ensure effectiveness of disinfectants.

3. N95 Respirator

- N95 respirators (masks) protect you from inhaling droplet or aerosolized pathogens into your nose and lungs. Surgical masks are not respirators. They do not protect against aerosol and small droplets. They filter out large-size particles in the air and offer protection from large droplets and direct contact.
- There are several different models, styles, and sizes of N95 and comparable respirators that fit a variety of face shapes and sizes. Each person requiring a respirator for PREDICT activities should be individually fit tested to identify a respirator that appropriately and comfortably fits her or his face.
- Respirators with exhalation valves are generally more comfortable as the exhalation valve prevents resistance to exhalation when the filters load with dust.
- See ***Section 4.5*** on respirator use to learn more about respirators and fit testing.

4. Goggles and Face Shields



- Goggles protect your eyes from splashes and liquids.
- They are adjustable to ensure the best fit. Adjust the head strap before putting on all of the PPE. The goggles should fit snuggly over and around your eyes.
- Personal glasses are not a substitute for goggles or safety glasses; if you wear eyeglasses, the goggles or safety glasses should be placed over them.
- If ordering goggles, be sure to order fog-free goggles. If they are not fog-free, they are likely to fog up in a few minutes, rendering them useless. If all you have are non-fog-free (regular) goggles, you may rub a little soapy water on the inside of the lens prior to use to reduce fogging.
- Goggles (and rubber boots) are one of the few components that may be re-used if disinfected properly after each use.

5. Gloves

- Nitrile gloves are best for use for infectious agent exposure protection. **Gloves are a component of minimum PPE required for sample collection and handling tasks conducted under PREDICT.**
- Two pairs of nitrile gloves are recommended when using sharps.
- Heavy rubber gloves or leather gloves may be required when handling animals and can be worn over the nitrile gloves. PREDICT teams have good success with Hexarmor Hercules 400R6E gloves.

6. Disinfecting Wipes and Alcohol-based Hand Sanitizing Gel (at least 60% alcohol) -- for disinfecting gloves and hands.

- Disinfecting wipes that contain at least 60% alcohol should be used to clean your gloves and other PPE before removing them.
- Alcohol-based wipes or hand sanitizing gel can be used to clean areas of skin that may have been contaminated. It is critical to remove organic material before using sanitizers to ensure effectiveness of disinfectant.
- It is recommended that you ALWAYS disinfect and wash your hands after removing gloves, regardless of contamination.

7. Infectious Waste Bag—for the safe disposal of PPE and other medical waste.

- A color coded infectious waste bag (or otherwise labeled biohazard bag) should be available at the field site for containing and disposing of used PPE items.
- As soon as you remove a contaminated item, place it in the infectious waste bag.
- Do not over fill bags and ensure they can be closed and tied.
- Tie the bag at the top and spray the outside of the bag with disinfectant once it is closed and tied. Wet waste should be double-bagged to prevent leakage.
- Leave it at the designated collection site or place it in in a secure container for transport to a proper disposal site.
- Containers should be constructed to contain all contents and prevent leakage of fluids during handling, storage, and transport.
- It is strongly recommended that field teams do not burn or bury medical waste at the field site. Incomplete burning may leave infectious or dangerous materials, and animals or children may dig up buried waste. All bio-hazardous waste should be contained and returned to a medical center for autoclaving or incineration. **See *Section 2.5 Safe Disposal of Carcasses and Infectious Waste Guide* for information regarding guidelines for waste disposal.**

Procedure for Putting on PPE

All of the components of PPE discussed below are not necessary or appropriate for all PREDICT tasks. For instance, Tyvek or Tychem coveralls and aprons are not necessary for many PREDICT tasks. However, when investigating disease outbreaks or other potentially high-risk situations, the PPE and donning and doffing procedures may be substantially enhanced to reduce risk of exposure. See http://www.cdc.gov/vhf/ebola/hcp/ppe-training/index.html for CDC Guidelines for Personal Protective Equipment (PPE) Donning and Doffing Procedures during management of Ebola virus disease cases.

1. Wash your hands and/or disinfect them with alcohol-based hand sanitizing gel prior to putting on PPE.

2. Coveralls or dedicated clothing go on FIRST. Always start with the coveralls (which should be big and loose to fit over clothing and not restrict movement) or dedicated clothing. Be certain to zip up coveralls or button up clothing.

3. **Shoe covers or boots go on SECOND.** Shoe covers fit over the coverall feet. Pant legs of dedicated clothing and coveralls should fit over the boots.

4. **Respirator or surgical mask goes on THIRD.** Of the equipment to be worn around the head and face, the mask or respirator is always first on and last off. On a mask with a metal nose clip, be sure to form the clip around the nose for a nice fit. Any time you put on a respirator, perform a seal check by inhaling sharply. If there is air leakage around the edges of the mask, readjust to ensure a proper seal.

5. **Goggles go on after the respirator.** Goggles should fit snuggly over and around your eyes. Goggle straps should be adjusted to fit your head.

Once the respirator and goggles are in place, pull the hood on your coveralls over your head (or put on the separate head cover if the coveralls do not have a hood).

6. **Tie on the apron over the coveralls or your dedicated clothing.** Place the apron over your head and then tie it in the back.

7. **Put on two pairs of gloves.** The inner glove should go under the sleeve of the coverall to prevent exposed skin between the coverall and the glove. Coveralls with finger loops that secure the sleeve over the first pair of gloves are ideal to avoid exposure of the wrist area (or you can make a small cut in the coverall sleeve and introduce your thumb). Otherwise, tape the coverall sleeve to the inner glove. Put the second pair of gloves on over the first pair and extend the gloves over the coverall cuffs.

Procedure for Removing PPE

After completing your work, assume the exterior of the PPE is contaminated. The goal of correct removal of PPE is to minimize contact between your clothes and skin and the contaminated outer surfaces of the PPE.

1. **Wipe off any visible contamination of the PPE** using germicidal or alcohol-based wipes and dispose of the used wipe in the infectious waste bag.

2. **Remove and dispose of the apron** in the infectious waste bag.

3. **Wipe off outer gloves with a germicidal wipe and dispose of the used wipe** in the infectious waste bag.

4. **Remove boots or remove shoe covers** by holding the top and rolling them off of your feet. Place the shoe covers in the infectious waste bag. Place the boots in the equipment collection bag for disinfection and re-use.

5. **Remove the outer gloves** and place them in the infectious waste bag. Using one gloved hand, grasp the outside of the opposite glove near the wrist. Pull and peel the glove inside-out and away from the hand. Hold the removed glove in the opposite gloved hand. Then, slide one or two fingers of the ungloved hand under the wrist of the remaining glove. Peel glove off from the inside, creating a bag for both gloves. Dispose of the gloves in the infectious waste bag.

6. **Disinfect your inner gloves with alcohol-based hand sanitizing gel.**

7. Unzip and roll down the coveralls until they are inside out and place them in the infectious waste bag.

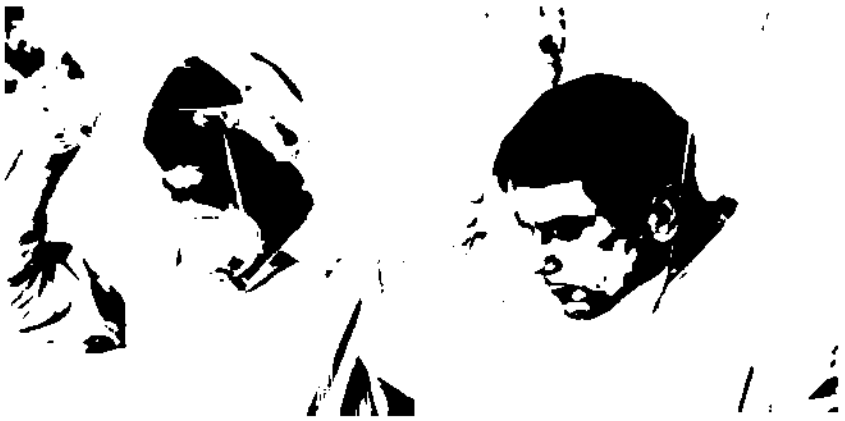
8. Disinfect gloves with alcohol-based hand sanitizing gel.

9. Remove the goggles by the strap and place them in the infectious waste bag or equipment collection bag for disinfection and re-use if re-usable. Re-suable goggles can be disinfected using a chlorine bleach solution.

10. Disinfect gloves with alcohol-based hand sanitizing gel.

11. Close the biohazard bag by tying the corners of the top of the bag together.

12. Remove the respirator by grabbing the top and then the bottom elastic bands, and pulling the bands up over your head or by grabbing the nose and pulling forward and then off. Place the respirator **in a second clean red infectious waste bag**.



13. Disinfect gloves with alcohol-based hand sanitizing gel.

14. Remove the inside gloves using the procedures listed in #5 above and place them in the second infectious waste bag. Dispose of infectious waste bags according to guidelines in Section 4, #6 e above.

15. Disinfect your hands with alcohol-based hand sanitizing gel.

16. Wash your hands and wrists using soap and running water (from a tap or poured) following the guidelines presented in Section 2.

If PPE is compromised, falls off, rips or is removed while you are handling or are exposed to biological hazardous materials, stop your current activity, remove PPE in the designated area, and wash or disinfect the exposed skin/surfaces. In addition, immediately inform your supervisor to determine if prophylaxis is indicated.

Section 4.5. Respirator Use

- Using respirators alone will not fully protect you from acquiring an infection – the respirator must be used in combination with all of the other PPE components.
- Each person using respirators must be fit tested to identify a respirator that he or she can comfortably and securely wear. Fit testing is a process that takes approximately 15-20 minutes to complete and should be performed for each member of the field team before he or she uses any respirators in the field. Qualitative fit test kits are available for purchase through 3M. A video on fit testing is available online at **https://www.youtube.com/watch?v=7IAsoU6h-8g**. After passing a fit test with a respirator, you should always use the same make, model, style, and size of respirator that was found during the fit test process to create an effective seal around your face. If you have facial hair, it is unlikely that you can properly fit a disposable particulate respirator. Workers who cannot ensure a proper fit because of facial hair or other fit limitations should consider a loose-fitting (i.e., helmeted or hooded) powered air purifying respirator equipped with high-efficiency filters. More information on respirators and respiratory protection can be found at: **https://www.osha.gov/SLTC/etools/respiratory/index.html**.
- Do not use or provide others with respirators without instruction on the health risks associated with them. For example, workers with respiratory problems may not be able to wear these respirators. Anytime someone indicates they are having trouble breathing while wearing a respirator, they should go to the PPE removal site and remove their respirator.

- When disposable particulate respirators become wet from saliva, sweat, or respiratory secretions, they lose their protective properties and must be changed.
- If a respirator is splashed and becomes wet, it should be changed using gloves and the gloves disinfected or washed following hand washing procedures.
- Respirators should be discarded and replaced after 4-6 hours of use.
- Respirators should not be hung around your neck when working. Always wear them when working.

Section 4.6. References

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Response to debrief comments and requests for clarification

Date of response: March 17, 2020

Thank you for the feedback and requests for additional detail. Please find our responses below (in italics), referring to additions or updates to the Technical Proposal and other project proposal sections in accordance with the recommendations.

Recommend the applicants consider approaches in which a greater proportion of the work is conducted in-country (to the extent practical).

Thank you for the recommendation. We have made some adjustments to the allocation of work accordingly, now reflected in the budget and budget justification. The main changes are:
We have shifted activities for training and laboratory work in Egypt to the Princess Haya Laboratory at the Jordan University of Science and Technology (JUST). Except for one initial training in Egypt at the National Research Center, the Human Link consultant will provide training in Jordan to the Jordanian team and no samples will be transported outside of Jordan. Funds have been allocated now for equipment needed to conduct MERS virus neutralization at the Princess Haya Biotechnology Center at JUST. This is a unique opportunity to operationalize this capacity in Jordan for the first time, leveraging the operational partnership with Human Link to build in-country capacity.
We have also reduced staff time and travel on the part of the US-based team to the amount that we are certain we can still provide the rigor of collaboration necessary to support the overall team, capacity strengthening, and scientific exchange and dissemination. We will rely on frequent remote communications (e.g. via Zoom or Skype) for pre-training and preparation to maximize time between EHA, JUST and Human Link.

Recommended applicants provide greater detail on a "culturally- and financially-appropriate token of appreciation" for patients enrolled in the study. Recommend applicants establish a regimen for this "appreciation token" approach in order to reduce attrition rate of participants following the initial enrollment phase of the study.

Please find additional detail now added (page 6). Participants will be given a cell phone calling card at each visit. This token has utility for participants and acknowledges their time without introducing undue influence to participate.
For sites with animal sampling, we will distribute veterinary medicines and supplies for common animal diseases (e.g. anti-parasitics) as needed up to a reasonable amount at every other visit. This approach has been successful in past field projects undertaken in Jordan, leveraging the existing veterinary expertise of our team and promoting overall disease awareness. This is based on the last five years of work that our JUST animal health investigators have been using in outreach to herders and producers. We have budgeted for these at $100 per site visit twice a year.

Recommend applicants provide a more detailed description of the methods for obtaining

human samples. For example, will samples be obtained in the field at time of recruitment or will participants be referred to a local healthcare facility?

Thank you. Please find additional detail now included (page 7 under "human sampling"). The teams will have a nurse when working with herders or farmers in remote locations and conduct sampling in a safe, semi-private and shaded area (e.g. a field tent or shelter). If sampling at a community near to a clinic, we will set up appointments with participants to have samples collected at a clinic. This approach seeks to minimize time burden and maximize comfort while ensuring consistent safety for all participants.

Recommend applicants clarify whether abattoirs will be included as a sampling "site" and the strategy for such an approach. Abattoirs are briefly mentioned in the abstract; however, not repeated elsewhere in the proposal.

We have eliminated abattoirs as a sampling site (page 1 (abstract)). We had originally considered abattoirs when first developing the concept but as we refined the project design it became clear it was not necessary for the research and to answer our hypotheses. Our apologies for inadvertently leaving it in the abstract.

Recommend applicants provide an overview/flowchart for the integration of all diagnostic procedures; human and animal.

Please find the process flowchart now provided in Attachment 3 reflecting the diagnostic procedures and the treatment of human and animal samples. While we recognize the strategy is complex to present, the implementation on the ground is seamless (as tested by our PREDICT field and laboratory activities when rolled out for a more limited diagnostic panel) and will leverage the proximity between the laboratories for high efficiency (in both time and resources) and effective coordination.

Recommend applicants include greater detail about students and personnel who will be trained in support of research activities.

Additional details have now been added to the Technical Proposal to emphasize the extent and value of the training of students and ministry colleagues (page 9).
We estimate four students per year will be trained over the course of the project. To reach professional students who can directly integrate their skills and capacity into their work in the future to promote sustainable uptake in the country, we anticipate training of:

- *8 veterinary students, including 4 undergraduate and 4 graduate, students to work in the field or the lab;*
- *4 students from the school of Public Health for the field epidemiology and socioeconomic analyses;*
- *4 students from the biomedical sciences for laboratory training; and*
- *4 undergraduate or graduate students from the nursing school to observe informed consent, sampling, and transport protocols.*

All students (as well as all other personnel) participating in the project field, laboratory or analysis activities will be CITI-trained and receive full training to ensure

safety and ethics practices are constantly observed. Co-I Abu-Basha and his team have extensive experience overseeing training and student research from the schools above at JUST, and the opportunity for the students to collaborate their project work with their peers from other disciplines is expected to also generate valuable collaboration and appreciation for One Health approaches as they enter their careers.
In addition, in-service training will be provided to Ministry of Health and Ministry of Agriculture laboratory scientists and epidemiologists during the workshops as described in Table 4 (page 9). We estimate a minimum of 20 ministry staff will participate in all of the training workshops. Co-I Abu-Basha has existing collaboration with these ministries through the One Health platform that will facilitate interest in the trainings and awareness about how the trainings can be applied in their work to advance implementation and sustainability of improved surveillance and detection capacity and risk reduction approaches.

Recommend applicants discuss sustainability following completion of the project.

The project design builds in several pathways to sustainability (please see additions on page 8, 9, and 11). In particular, we have now discussed sustainability under section "relevance" (page 11) regarding three major areas: strengthening capacity of laboratories in the south of Jordan, new technology at Princess Haya Biotechnology Center via MERS-CoV virus neutralization capacity that will appeal to government for its high quality and modernization of the country's disease detection system, and overall awareness and leadership about One Health strategies as part of biological threat reduction. The growing poultry industry also offers a potential source of long-term disease screening support as in other countries with poultry production incentivized to demonstrate risk reduction.

Recommend applicants modify the Human Link serology training. The serology training at Human Link in Egypt is not sustainable nor the best use of project funds. Currently, six personnel per year are travelling to and hand-carrying samples to Egypt to be trained on serology. It would increase Jordanian sustainability and be more fiscally responsible for the one Human Link trainer to fly to Jordan so the Jordanians can learn the technique in their own laboratory as well as reduce the overall costs and risks associated with hand-carrying biological materials.

We have shifted activities for training and laboratory work in Egypt to the Princess Haya Biotechnology Center in Jordan (please see pages 7-9 of the Technical Proposal). Except for initial training in Egypt, which will be useful for showcasing and training on operational equipment and building confidence for successful capacity transfer to Jordan, the Human Link consultant (Co-I Kayali) will provide training in Jordan to the Jordanian team via visits each year and via regular communication for quality control. No samples will be moved outside of Jordan now. This approach leverages the operational and trusted partnership with Human Link to build in-country capacity and promote successful capacity transfer and support that is valuable for long-term capacity development and maintenance. As well noted by reviewers, this will help shift to the

fiscal buy-in from Jordan and also allow for close collaboration between the human and animal laboratory experts for coordinated interpretation of findings.

Recommend applicants consider the workload of the EHA Senior P.I. and make appropriate adjustments, as necessary. Per the current and pending support document, the EHA Senior P.I. is already overcommitted with 15.74 calendar months of work each year. If funded, this project would add an additional 2 calendar months of work each year. This is not a sustainable workload and there is concern the P.I. will not be able to contribute the stated amount to this project.

Thank you for your concern. The current and pending support document listed a range of current and prospective opportunities. All staff at EHA are continually submitting proposals for new projects that include our time. Only a few are awarded and our time commitments are thus allocated to the ones that are awarded and are not utilized for the proposals not awarded. PI Karesh's form has now been updated with the latest information and time allocations. Given the specialized work and capacity required for DTRA projects, all DTRA proposals take priority for our time allocation; for other pending proposals (non-DTRA), if indeed successfully awarded, additional staff would be hired by EHA to work on those projects to ensure we are not committed beyond 12 calendar months per staff member.

Recommend updating the below PRAT concerns and submitting revised PRATs:

We have included revised PRATs in our submission addressing these questions and recommendations (detailed briefly below as well). We appreciate these important details. (Separately, we note that these and other biosafety and biosecurity practices will be reinforced at the workshops as well for greater awareness and safeguards across the national system too).

Rational and justification for using an aerosol chamber.
Thank you – this was selected in error and is not needed. We have updated it accordingly.

Provide information for type, number, and certification dates for biosafety cabinets on biosafety supplemental page.
Please see the requested information now attached (in Attachment 3), via six certificates for the two biosafety cabinets in Facility 2 and two certificates for the biosafety cabinet in Facility 4.
Recommend maintaining facility records for certification of biosafety cabinets for Facility 1. Recommend a facility biorisk assessment occurs at Facility 2 by a biosafety professional prior to full project approval.

This will be done by Eng. Radi Hamasha, Head of quality assurance in Princess Haya Biotechnology Center. We have added his name as the biosafety officer and we will begin the process to complete both prior to full project approval.

Also, recommend using a facility specific biorisk management manual at Facility 2 to document how biohazards are mitigated at this laboratory (Section 3c).

This will be implemented through the help of Eng. Radi Hamasha, Head of quality assurance in Princess Haya Biotechnology Center.

Recommend having emergency eyewash bottles available if a hard-plumbed eyewash is not present.

Excellent suggestion. We have now budgeted for these and will make sure they are maintained throughout the project.

Recommend ensuring staff wash hands prior to leaving laboratory spaces despite not having a sink near laboratory exits at Facility 1.

Thank you; we will ensure a protocol is formally put into place and reinforced visually and in training and enforcement. This is already a generally utilized practice in our laboratories, but we agree about the value of formalizing it.

Recommend instituting limited access practices such that personnel only enter labs necessary for completing their tasks. Recommend having emergency eyewash bottles available if a hard-plumbed eyewash is not present at Facility 2 (section 4b).

Restriction access is implemented (for example, keys are only in the hands of approved personnel who are participating in this study). Per the university approval, we are adding safeguards (including a security fingerprint door lock, which we have now budgeted for). Regarding the eyewash bottles, we will purchase them and ensure our laboratory members are trained on their proper use.

This proposal conveys an approach by the relevant implementers to achieve biological threat reduction mission requirements in collaboration with partners from Jordan, Iraq and Lebanon. Despite this, additional information, in a revised proposal, for the items as noted above, is needed to better appreciate the full implications, implementation plans, costs, and expected results of the proposed study.

Thank you for the feedback and for the opportunity to submit a revised proposal.

PRIME Budget

Y1	Y2	Y3	OY1	OY2	Base		Y1	Y2	Y3	OY1	OY2	Total
2	2	2	2	2	$ 251,211.20	A. Senior Key Personnel						
						William Kayesh - PI	$ 46,535.20	$ 28,007.90	$ 28,567.98	$ 58,994.34	$ 295,197.62	
						William Kayesh - Fringe	$ 17,508.80	$ 10,534.00	$ 10,744.68	$ 22,193.46	$ 95,052.64	
3	3	3	3	1	$ 87,717.12	Emily Horgan, Deliverable Task Supervisor	$ 28,918.20	$ 17,723.85	$ 18,078.33	$ 37,351.20	$ 101,306.10	
						Emily Horgan Fringe	$ 6,359.34	$ 8,548.35	$ 8,871.80	$ 7,915.68	$ 34,335.23	
4	4	4	4	2	$ 85,884.58	Catherine Mackenzie, Data Analyst	$ 26,528.26	$ 30,209.71	$ 31,582.69	$ 33,140.88	$ 165,888.80	
						Catherine Mackenzie Fringe	$ 10,535.21	$ 11,301.97	$ 11,811.67	$ 12,195.92	$ 61,415.16	
2	2	2	2	1	$ 98,102.04	Athena Eagle, Modeler	$ 12,516.11	$ 13,141.76	$ 13,811.05	$ 17,452.15	$ 69,241.08	
						Athena Eagle Fringe	$ 5,516.54	$ 5,543.85	$ 6,857.73	$ 6,715.93	$ 24,774.06	
	Fringe Rate =	36.8%				Total Senior Key Personnel	$ 148,968.76	$ 155,278.15	$ 163,557.05	$ 171,765.40	$ 831,684.36	
						B. Other Personnel						
3	3	3	3	1	$ 59,725.11	Amanda Ardie, Program Coordinator	$ 14,936.52	$ 15,227.43	$ 16,451.29	$ 17,094.93	$ 62,902.39	
						Amanda Ardie Fringe	$ 5,494.00	$ 5,601.25	$ 6,051.07	$ 6,287.63	$ 23,133.95	
12	12	12	12	10	$ 61,003.20	Research Assistant	$ 61,003.20	$ 61,003.20	$ 67,756.83	$ 70,615.73	$ 341,782.16	
						RA Fringe	$ 22,448.00	$ 23,576.40	$ 24,748.92	$ 25,985.37	$ 124,639.37	
	Fringe Rate =	36.8%				Total Other Personnel	$ 103,879.11	$ 109,007.95	$ 116,520.45	$ 120,245.45	$ 573,969.16	
						C. Equipment						
						Total Equipment	$ -	$ -	$ -	$ -	$ -	
						D. Travel						
						1. Domestic Travel	$ 4,867.80	$ 7,537.80	$ 7,842.89	$ 7,842.89	$ 35,889.06	
						2. Foreign Travel	$ 31,340.00	$ 31,532.50	$ 36,038.59	$ 36,038.59	$ 173,101.00	
						Total Travel	$ 36,207.80	$ 39,070.30	$ 43,881.48	$ 43,881.48	$ 208,990.06	
						E. Participant Trainee Support Costs						
						1. Tuition, Fees, and Health Insurance	-	-			$ -	
						2. Stipends	-	-			$ -	
						3. Travel					$ -	
						4. Subsistence					$ -	
						5. Other					$ -	
						Total Participant Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	
						F. Other Direct Costs						
						1. Materials and Supplies	$ 6,240.12	$ 2,312.50	$ 2,312.50	$ 2,312.50	$ 17,490.45	
						2. Publication Costs	$ -	$ 5,270.30	$ 5,270.30	$ -	$ 17,810.90	
						3. Consultant Services	$ 5,500.00	$ 5,500.00	$ 5,500.00	$ 5,500.00	$ 27,500.00	
						4. ADP Computer Services	-	-			$ -	
						5. Subawards/Consortium/Contractual Costs					$ -	
						OH	$ 251,211.20	$ 256,235.42	$ 261,360.13	$ 266,587.33	$ 1,035,394.08	
						Human Use	$ 11,479.12	$ 11,140.80	$ 11,140.80	$ 11,140.80	$ 56,042.13	
						6. Equipment, Facility Rental, User Fees	-	-			$ -	
						7. Alterations and Renovations	-	-			$ -	
						8. Other					$ -	
						9. Other					$ -	
						Total Other Direct Costs	$ 273,190.44	$ 279,247.02	$ 285,623.73	$ 287,560.63	$ 1,353,631.56	
						G. Direct Costs Minus Modified Direct Costs						
						Direct Costs	$ 362,287.51	$ 343,727.95	$ 336,687.39	$ 336,686.67	$ 1,650,669.64	
						Modified Direct Costs					$ -	
						H. Indirect Costs						
	IDC Rate =	35.84%				1. Indirect Cost Type	$ 108,438.45	$ 112,438.17	$ 118,5 [illegible] 81	$ 121,207.86	$ 561,163.56	
	IDC Rate =	35.84%				2. Indirect Cost Type	$ 311,398.93	$ 8,988.99	$ 852.98	$ -	$ 17,020.00	
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 422,526.38	$ 431,234.69	$ 420,540.36	$ 457,894.53	$ 2,250,293.20	
						J. Fee						
						Fee	-	-			-	
						K. Total Costs and Fee						
						Total Costs	$ 422,526.38	$ 431,234.69	$ 420,540.36	$ 457,894.53	$ 2,250,293.20	
						1000 CALL Totals						
							$ 284,260.61	$ 291,345.45	$ 297,115.18	$ 314,851.33	$ 1,189,881.58	

Y1&2 Supplies	Unit/Group	Y1	Y2	OY1	OY2	
Laptop	$ 2,999.00	$ 5,998.00				$ 5,998.00
iPad	$ -	$ -	$ -	$ -	$ -	$ -
Monitor	$ 367.50	$ 735.00	$ 367.50	$ 735.00	$ 367.50	$ 2,205.00
Adobe	$ 792.00	$ 792.00	$ 792.00	$ 792.00	$ 792.00	$ 3,960.00
Headset	$ 249.00	$ 249.00				$ 249.00
Microphone	$ 150.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 1,200.00
						$ -
Software Suite	$ 367.50	$ 735.00	$ 367.50	$ 735.00	$ 367.50	$ 2,205.00
Zoom	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 750.00
Miscellaneous	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 125.00
TOTALS		$ 8,840.00	$ 2,312.50	$ 2,312.50	$ 2,312.50	$ 17,490.45

Travel Estimates	Y1	Y2	OY1	OY2
PMR PIs	$ 1,500.00	$ 500.00	$ 500.00	$ 500.00
All Trainees	$ 1,367.50			
TOTAL	$ 2,867.50	$ 500.00	$ 500.00	$ 500.00

public Overhead	Y1	Y2	Y3	OY1	OY2
F&A Rate		26.8%	26.8%		
Scientific Repairs		26.8%	26.8%		
Fees		26.8%	26.8%		
Total	0	26.8%	26.8%	0	0

International Travel						TOTAL
Traveler 1 - William Karesh (Armiger)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 270.00	$ 270.00	$ 270.00	$ 270.00	$ 270.00	
Flight Estimate	$ 4,566	$ 4,566	$ 4,566	$ 4,566	$	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 9,446.00	$ 9,446.00	$ 9,446.00	$ 9,446.00	$ 7,780.00	$ 49,964.00
Traveler 2 - William Karesh (Field)						
Hotel Max Per Diem	$ 384.00	$ 384.00	$ 384.00	$ 384.00	$ 384.00	
Meals and Incidental Expenses Per Diem	$ 472.50	$ 472.50	$ 472.50	$ 472.50	$ 472.50	
Taxi Estimate	$ 285.00	$ 285.00	$ 285.00	$ 285.00	$ 285.00	
Flight Estimate						
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 6,707.50
Traveler 3 - Catherine Machalaba (Armiger)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 270.00	$ 270.00	$ 270.00	$ 270.00	$ 270.00	
Flight Estimate	$ 4,566	$ 4,566	$ 4,566	$ 4,566	$ 4,566	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 9,446.00	$ 9,446.00	$ 9,446.00	$ 9,446.00	$ 9,446.00	$ 47,230.00
Traveler 4 - Catherine Machalaba (Field)						
Hotel Max Per Diem	$ 1,314.00	$ 2,628.00	$ 2,628.00	$ 2,628.00	$ 2,628.00	
Meals and Incidental Expenses Per Diem	$ 997.50	$ 1,995.00	$ 1,995.00	$ 1,995.00	$ 1,995.00	
Taxi Estimate	$ 435.00	$ 870.00	$ 870.00	$ 870.00	$ 870.00	
Flight Estimate						
No. Days	10	10	10	10	10	
No. Trips per Year	1	2	2	2	2	
Total	$ 2,746.50	$ 5,493.00	$ 5,493.00	$ 5,493.00	$ 5,493.00	$ 24,718.50
Traveler 5 - Emily Hagan (Armiger)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 270.00	$ 270.00	$ 270.00	$ 270.00	$ 270.00	
Flight Estimate	$ 6,415	$ 6,415	$ 6,415	$ 6,415	$ 6,415	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 13,195.00	$ 18,195.00	$ 18,195.00	$ 18,195.00	$ 18,195.00	$ 90,975.00

Traveler 6 - International Conference (IMEC)	Vienna					
Hotel Max Per Diem	$ 819	$ 819	$ 1,638	$ 1,638	$ 1,638	
Meals and Incidental Expenses Per Diem	$ 240	$ 240	$ 480	$ 480	$ 480	
Taxi Estimate	$ 255.00	$ 255.00	$ 510.00	$ 510.00	$ 510.00	
Flight Estimate	$ 1,493	$ 1,493	$ 2,986	$ 2,986	$ 2,986	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	2	2	2	
Total	$ 2,807.00	$ 2,807.00	$ 5,614.00	$ 5,614.00	$ 5,614.00	$ 22,456.00
Visa Fees	$ 504.00	$ 504.00	$ 504.00	$ 504.00	$ 504.00	$ 2,520.00
Vaccination Costs	$ 880.00					$ 880.00
Conference Registration Fees	$ 500.00	$ 500.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 4,000.00
YEARLY TOTALS	$ 51,616.00	$ 53,537.50	$ 36,839.50	$ 36,839.50	$ 34,374.50	$ 175,101.00
Conference		Vienna				
ISID/IMEC	500	Indian		55		

Domestic Travel						TOTAL
Traveler 1 - William Karesh (NY-DC)						
Hotel Max Per Diem	$ 512	$ 256	$ 512	$ 512	$ 512	
Meals and Incidental Expenses Per Diem	$ 228	$ 114	$ 228	$ 228	$ 228	
Taxi Estimate	$ 90.00	$ 45.00	$ 90.00	$ 90.00	$ 90.00	
Transportation Estimate	$ 492	$ 246	$ 492	$ 492	$ 492	
No. Days	2	2	2	2	2	
No. Trips per Year	2	1	2	2	2	
Total	$ 1,222.00	$ 611.00	$ 1,222.00	$ 1,222.00	$ 1,222.00	$ 5,499.00
Traveler 2 - Catherine Machalaba (NY-DC)						
Hotel Max Per Diem	$ 256	$ 256	$ 256	$ 256	$ 256	
Meals and Incidental Expenses Per Diem	$ 114	$ 114	$ 114	$ 114	$ 114	
Taxi Estimate	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	
Transportation Estimate	$ 106	$ 106	$ 106	$ 106	$ 106	
No. Days	2	2	2	2	2	
No. Trips per Year	1	1	2	2	2	
Total	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 3,055.00
Traveler 3 - Attending Meeting in VA						
Hotel Max Per Diem	$ 1,024	$ 1,024	$ 1,024	$ 1,024	$ 1,024	
Meals and Incidental Expenses Per Diem	$ 282	$ 282	$ 282	$ 282	$ 282	
Taxi Estimate	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	
Transportation Estimate	$ 1,011	$ 1,011	$ 1,011	$ 1,011	$ 1,011	
No. Days	4	4	4	4	4	
No. Trips per Year	2	2	2	2	2	
Total	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 14,324.00
Traveler 4 - Presenting Partner at Mig 65 MH (Maryland)						
Hotel Max Per Diem	$ -	$ 924	$ 924	$ 924	$ 924	
Meals and Incidental Expenses Per Diem	$ -	$ 407	$ 407	$ 407	$ 407	
Taxi Estimate	$ -	$ 210.00	$ 210.00	$ 210.00	$ 210.00	
Transportation Estimate	$ -	$ 634	$ 634	$ 634	$ 634	
No. Days	0	4	4	4	4	
People Attending	0	2	2	2	2	
Total	$ -	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 9,260.00

Conference Registration Fees	$	$ 930.00	$ 930.00	$ 930.00	$ 930.00	
YEARLY TOTALS	$ 4,807.80	$ 7,331.80	$ 7,042.80	$ 7,042.80	$ 7,042.80	$ 32,138.00
Airfare	$ 465.00					

Y1	Y2	Y3	OY1	OY2	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

OC Rate >

OC Rate >

Budget Line	Y1	Y2	Y3	OY1	OY2	Total
A. Senior Key Personnel						
[illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
	$	$	$	$	$	$ -
Total Senior Key Personnel	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
B. Other Personnel						
Total Other Personnel	$	$	$	$	$	$
C. Equipment						
Total Equipment	$	$	$	$	$	$ -
D. Travel						
1. Domestic Travel						$ -
2. Foreign Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Total Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$
2. Stipends						$
3. Travel						$ -
4. Subsistence						$ -
5. Other						$ -
Total Participant/Trainee Support Costs	$	$	$	$	$	$ -
F. Other Direct Costs						
1. Materials and Supplies		$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Publication Costs						$
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$ -
6. Equipment or Facility Rental/User Fees						$ -
7. Alterations and Renovations						$
8. [illegible]						$
9. Other						$
Total Other Direct Costs	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Modified Direct Costs						$ -
H. Indirect Costs						
1. Indirect Cost Type	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct+Indirect	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
J. Fee						
Fee						
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

[illegible]						
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$	$	$	$	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Total	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

Y1	Y2	Y3	OY1	OY2	Base	JUST	Y1	Y2	Y3	OY1	OY2	Total
12	12	12	12	12	$ 127,940.00	A. Senior/Key Personnel						
						Dr. Ehab Abu-Basha, CoPI	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 639,700.00
						Dr. Ehab Abu Basha Fringe	$ -	$ -	$ -			$ -
8	8	8	8	8	$ 19,301.80	Hani Talafha, Biologist	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 64,339.33
						Hani Talafha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	12	12	12	12	$ 32,520.00	Zaicoun Hijazeen, Veterinarian	$ 5,420.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 135,500.00
						Zaicoun Hijazeen Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 54,091.53	Mustafa Ababneh, Virologist/Lab Director	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 67,989.41
						Mustafa Ababneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2.5	2.5	2.5	2.5	2.5	$ 57,903.18	Zuhair Bani Ismail, Livestock ID Expert	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 60,315.81
						Zuhair Bani Ismail Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 69,597.00	Borhan Al-zoghool, Molecular Biologist/Lab Director	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 86,996.25
						Borhan Al-zoghool Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 23,112.00	Bilal Al-Omari, Lab Supervisor	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 28,890.00
						Bilal Al-Omari Fringe	$ -	$ -	$ -	$ -	$ -	$ -
1	1	1	1	1	$ 177,018.63	Wail Hayajneh, Human ID Expert	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 73,757.76
						Wail Hayajneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
			Fringe Rate-->			Total Senior/Key Personnel	$ 209,817.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 1,157,488.57
						B. Other Personnel						
1	1	1	2	2	$ 58,241.66	Saad Gharaibeh, Avian Pathologist	$ 4,853.47	$ 4,853.47	$ 4,853.47	$ 9,706.94	$ 9,706.94	$ 33,974.30
						Saad Gharaibeh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3.5	3.5	3.5	3.5	3.5	$ 28,219.16	Admin	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 41,152.94
						Admin Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	4	4	3	0	$ 47,860.32	Nurses (x2)	$ 15,953.44	$ 31,906.88	$ 31,906.88	$ 23,930.16	$ -	$ 103,697.36
12	12	12	12	12	$ 2,538.84	Undergrad. Student Stipends (x2)	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 25,388.40
12	12	12	12	12	$ 3,385.08	Graduate Student Stipends (x2)	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 33,850.80
			Fringe Rate-->			Total Other Personnel	$ 40,885.34	$ 56,838.78	$ 56,838.78	$ 53,715.53	$ 29,785.37	$ 204,089.50
						C. Equipment						
						Vehicle	$ 37,150.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 44,470.00
						Luminescence plate reader	$ 28,840.00					
						Total Equipment	$ 65,990.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 73,315.00
						D. Travel						
						1. Domestic Travel	$ 40,108.00	$ 62,626.00	$ 62,626.00	$ 51,367.00	$ 12,360.00	$ 229,087.00
						2. Foreign Travel	$ 37,433.50	$ 26,890.00	$ 26,890.00	$ 26,890.00	$ 29,815.50	$ 148,019.00
						Total Travel	$ 77,541.50	$ 89,516.00	$ 89,516.00	$ 78,257.00	$ 42,175.50	$ 377,106.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 36,933.96	$ 18,784.77	$ 7,666.97	$ 10,255.19	$ -	$ 73,640.89
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/ User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other Testing	$ 53,500.00	$ 53,500.00	$ 77,500.00	$ 65,500.00	$ -	$ 250,000.00
						9. Other - Meetings and Conferences	$ 27,589.08	$ 39,205.05	$ 17,366.69	$ 39,205.05	$ 91,885.27	$ 215,251.14
						Total Other Direct Costs	$ 118,023.04	$ 111,489.82	$ 102,533.66	$ 114,960.24	$ 91,885.27	$ 538,892.03
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 512,263.59	$ 496,592.31	$ 487,636.15	$ 485,680.49	$ 402,893.86	$ 2,384,866.40
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate -->		8%	1. Indirect Cost Type	$ 40,981.09	$ 39,727.39	$ 39,010.89	$ 38,854.44	$ 32,215.51	$ 190,789.31
			IDC Rate-->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	$ 2,575,655.72

International Travel						TOTAL
International Conference (IC) Expenses						
Hotel Max Per Diem	$ 1,275	$ 1,275	$ 1,275	$ 1,275	$ 1,275	
Meals and Incidental Expenses Per Diem	$ 1,650	$ 1,650	$ 1,650	$ 1,650	$ 1,650	
Site Expenses	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	
Flight Estimate	$ 3,742	$ 3,742	$ 3,742	$ 3,742	$ 3,742	
Pre-Days	1	1	1	1	1	
Post-Days	1	1	1	1	1	
Total	$ 9,168.00	$ 9,168.00	$ 9,168.00	$ 9,168.00	$ 9,168.00	$ 45,840.00
Regional Conferences (RMI Distinct)						
Hotel Max Per Diem	$ 3,691	$ 3,686	$ 3,685	$ 3,685	$ 4,681	
Meals and Incidental Expenses Per Diem	$ 1,876	$ 1,874	$ 1,874	$ 1,874	$ 2,222	
Site Expenses	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	
Flight Estimate	$ 1,698	$ 2,264	$ 2,264	$ 2,264	$ 2,830	
Pre-Days	1	1	1	1	1	
Post-Days	1	1	1	1	1	
Total	$ 9,268.00	$ 9,274.00	$ 9,274.00	$ 9,274.00	$ 11,932.00	$ 48,972.00
OPSA Mig (x2)						
Hotel Max Per Diem	$ 1,283	$ 1,283	$ 1,283	$ 1,283	$ 1,283	
Meals and Incidental Expenses Per Diem	$ 426	$ 426	$ 426	$ 426	$ 534	
Site Expenses	$ 125.00	$ 125.00	$ 125.00	$ 125.00	$ 125.00	
Flight Estimate	$ 1,083	$ 1,083	$ 1,083	$ 1,083	$ 1,083	
Pre-Days	0	0	0	0	0	
Post-Days	1	1	1	1	1	
Total	$ 3,367.00	$ 3,367.00	$ 3,367.00	$ 3,367.00	$ 3,367.00	$ 16,835.00
Training (Travel) (JLOC, Exercises)						
Hotel Max Per Diem	$ 5,103	$ -	$ -	$ -	$ -	
Meals and Incidental Expenses Per Diem	$ 3,822	$ -	$ -	$ -	$ -	
Site Expenses	$ 1,000.00	$ -	$ -	$ -	$ -	
Flight Estimate	$ 2,303	$ -	$ -	$ -	$ -	
Pre-Days	1	0	0	0	0	
Post-Days	1	0	0	0	0	
Total	$ 13,568.00	$ -	$ -	$ -	$ -	$ 13,568.00
Civilian Travel	$ 4,543.00	$ 9,396.00	$ 5,396.00	$ 5,396.00	$ 6,245.00	$ 26,960.00
Visa Fees	$ 524.00	$ 524.00	$ 524.00	$ 524.00	$ 524.00	$ 2,620.00
YEARLY TOTALS	$ 37,439.00	$ 26,990.00	$ 26,990.00	$ 26,990.00	$ 29,915.00	$ 148,919.00

	Y1	Y2	Y3	Y4	Y5	
Total Days						
3 Star (PSA)	364	364	364	364	364	1820
0 - 3 Star Equiv (DTRA Mig and JLOC)	360	360	360	360	360	500
Total Days	724	724	724	724	724	2420
Conferences						
IC & RC	2000	2000	2000	2000	2000	10000
EN/ED/AD	3347	3396	3396	3396	4243	16050
Total Conferences	5347	5396	5396	5396	6243	26050

Annual Conference (IC, CY2)		5 People	5 Days		
Hotel Max Per Diem	$ 246.00	10	2	$	4,920.00
M&IE Expenses Per Diem	$ 330.00	10	2	$	6,600.00
Domestic Transport	$ 424.00	10	1	$	4,240.00
Registration Fees	$ 348.00	1	1	$	348.00
Translator and Scribe	$ 1,574.64	1	1	$	1,574.64
Room Rental	$ 1,100.00	1	1	$	1,100.00
Lunch and Coffee	$ 46.00	65	1	$	2,990.00
				$	17,366.66
Kick Off Meeting (KC, CY2)		5 People	5 Days		
Hotel Max Per Diem	$ 246.00	5	3	$	3,690.00
M&IE Expenses Per Diem	$ 330.00	5	3	$	4,950.00
Domestic Transport	$ 424.00	5	3	$	6,360.00
Registration Fees	$ 58.00	1	3	$	174.00
Translator and Scribe	$ 1,574.64	1	3	$	4,723.92
Room Rental	$ 1,100.00	1	3	$	3,300.00
Lunch and Coffee	$ 46.00	20	3	$	2,760.00
				$	25,957.92
Regional Meeting (Yr 1 IIT, Yr 2 CRIIT)		5 People	4 Days		
Regional Transport - Brazil	$ 366.00	2	1	$	732.00
Regional Transport - Lebanon	$ 409.00	2	1	$	818.00
Regional Transport - Italy	$ 453.00	2	1	$	906.00
Hotel Max Per Diem	$ 246.00	5	4	$	4,920.00
M&IE Expenses Per Diem	$ 330.00	5	4	$	6,600.00
Domestic Transport	$ 424.00	5	4	$	8,480.00
Registration Fees	$ 174.00	1	4	$	696.00
Translator and Scribe	$ 1,574.64	1	4	$	6,298.56
Room Rental	$ 1,100.00	1	4	$	4,400.00
Lunch and Coffee	$ 46.00	25	4	$	4,600.00
				$	37,450.56
Threat Reduction Workshop (TRW)		5 People	5 Days		
Hotel Max Per Diem	$ 246.00	22	5	$	27,060.00
M&IE Expenses Per Diem	$ 330.00	10	5	$	16,500.00
Domestic Transport	$ 424.00	10	5	$	21,200.00
Registration Fees	$ 1,250.00	1	5	$	6,250.00
Translator and Scribe	$ 1,574.64	1	5	$	7,873.20
Room Rental	$ 1,100.00	1	5	$	5,500.00
Lunch and Coffee	$ 46.00	45	5	$	10,350.00
Regional Transport - Lebanon	$ 409.00	4	1	$	1,636.00
Regional Transport - Italy	$ 469.00	4	1	$	1,877.00
				$	98,980.20

	Y1	Y2	Y3	CY1	CY2
Mission Specific Travel Costs	$ 27,589.05	$ 39,205.05	$ 13,906.95	$ 39,205.05	$ 91,885.23

Field Travel Costs	Y1	Y2	Y3	CY1	CY2
Travel Lodging Per Diems	$ 24,000.00	$ 24,000.00	$ 24,000.00	$ 22,400.00	$ -
Car	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 1,800.00
Vehicle Maintenance Costs	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Tokens or Appreciation	$ 10,000.00	$ 27,000.00	$ 27,000.00	$ 23,277.00	$ 10,000.00
TOTAL	$ 40,300.00	$ 62,628.00	$ 62,628.00	$ 53,367.00	$ 12,360.00

Travel Expense Per Diems	Y1	Y2	Y3	CY1	CY2	
# Days	2	4	4	3	0	
Per Diem	300	300	300	300	300	(3 locals, 1 3 months or Academy)
# days	2	2	2	2	2	
# sites	1	1	1	1	1	
Total	$ 24,000.00	$ 24,000.00	$ 24,000.00	$ 22,400.00	$ -	
Travel Approximate Per Diems	Y1	Y2	Y3	CY1	CY2	
# Smaller Qt	300	300	300	300	300	
# Quarters	2	4	4	3	0	
Per Diem Rates	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	
Per Diem Rates and	$ 11.25	$ 11.25	$ 11.25	$ 11.25	$ 11.25	at 3 Person Locations at 3/2
Total	$ 2,250.00	$ 13,050.00	$ 13,050.00	$ 10,237.50	$ -	
Translator/Interpreter Camp/Penalty	Y1	Y2	Y3	CY1	CY2	
# Smaller Qt	60	60	60	60	60	30 Locations at 2 Translators at
# Quarters	2	2	2	2	2	every quarter, Overseers other year
Per Diem Rates/Support	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Total	$ 12,000.00	$ 12,000.00	$ 12,000.00	$ 12,000.00	$ 12,000.00	
Steps	0 - 1k	1 - 5k	5k	Total		
A. Baseline	175	175	$ 1.53	$ 26.78		
A. Target	38.3	38.3	$ 1.53	$ 8.90		
A. Kenya	262	262	$ 1.53	$ 40.06		
Mexico	43.6	43.6	$ 1.53	$ 6.70		
Austria	11.6	11.6	$ 1.53	$ 302.46		
				$ 384.98		
	50000	3000	$ 1.53	$ 4,590.00		

Field Supplies				Y1		Y2		Y3		OY1		OY2	
Type	Units/Price	Price		Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total
Nunc 1.8 internal cryovials	450	$	$16.42	12	$ 6,197.04	17	$ 8,779.14	8	$ 4,131.36	10	$ 5,164.20		
Serum tubes 10 mL	100	$	31.09	25	$ 777.25	23	$ 715.07	12	$ 373.08	12	$ 373.08		
Serum tubes 3 mL	100	$	27.31	2	$ 54.62	0	$	1	$ 27.31		$		
Vaccutainer holder	250	$	20.77	50	$ 1,038.50	50	$ 1,038.50		$ -		$ -		
21g 1in vacutainer safety needles	48	$	39.92	30	$ 1,197.60	28	$ 1,117.76	15	$ 598.80	14	$ 558.88		
18g 1in vacutainer needles	100	$	32.19	5	$ 160.95	5	$ 160.95	3	$ 96.57	2	$ 64.38		
3cc luer lock syringe	100	$	21.80	2	$ 43.60		$ -	1	$ 21.80		$ -		
22g 1in needle	100	$	19.80	2	$ 39.60		$ -	1	$ 19.80		$ -		
Cotton Swabs	500	$	400.00	5	$ 2,000.00	10	$ 4,000.00	0	$	5	$ 2,000.00		
Gloves	50	$	29.65	7	$ 207.55	14	$ 415.10	0	$ -	6	$ 177.90	0	$ -
Masks N95	50	$	47.75	7	$ 334.25	7	$ 334.25	7	$ 334.25	5	$ 238.75	0	$ -
Tyvek Suits (project supply)	25	$	350.00	52	$ 18,200.00	0	$	0	$	0	$	0	$
Googgles (project supply)	12	$	135.00	2	$ 270.00	0	$ -	0	$ -	0	$ -	0	$ -
Booties (project supply)	200	$	300.00	7	$ 2,100.00	0	$ -	0	$ -	0	$ -	0	$ -
Biohazard Bag (project supply)	200	$	155.00	2	$ 310.00	0	$ -	0	$ -	0	$ -	0	$ -
Sharps Container	20	$	200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00		$ -
Alcohol Swabs	1200	$	32.00	4	$ 128.00	7	$ 224.00	2	$ 64.00	4	$ 128.00		$ -
Tablets	1	$	200.00	5	$ 1,000.00		$ -		$ -		$ -		$ -
Dry Ice	1 week	$	150.00	6	$ 900.00	12	$ 1,800.00	12	$ 1,800.00	9	$ 1,350.00		$ -
Eye wash station	1	$	275.00	1	$ 275.00		$ -		$ -		$ -		$ -
Card reader system		$	1,500.00	1	$ 1,500.00		$ -		$ -		$ -		$ -
TOTALS					**$ 36,933.96**		**$ 18,784.77**		**$ 7,666.97**		**$ 10,255.19**		**$ -**

Nunc 1.8 internal cryovials	PCRs - 2 swabs/animal or person
Serum tubes 10 mL	1 per human, 2 per animal serology
Serum tubes 3 mL	1 per chicken serology
Vaccutainer holder	100
21g 1in vacutainer safety needles	1 per human serology
18g 1in vacutainer needles	1 per camel serology
3cc luer lock syringe	1 per chicken serology
22g 1in needle	1 per chicken serology
Cotton Swabs	PCRs - 2 swabs/animal or person

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR -humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 17,500.00		$ 15.00	$ -
MERS PCR camels	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 7,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 7,000.00		$ 100.00	$ -
A PCR -humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 17,500.00		$ 15.00	$ -
A PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
A PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 7,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 7,000.00		$ 100.00	$ -
MERS Serology humans 3P	330	$ 40.00	$ 13,200.00	0	$ 40.00	$ -	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 17,200.00			
MERS Serology camels ELISA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$ -	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
A serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$ -	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$ -
A serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$ -	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$ -
A serology Subtype Tesing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$
Lepto Serovar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$			$			$			$			$
Lepto PCR camels			$			$			$			$			$
Lepto PCR other ruminants			$			$			$			$			$
			$ -			$ -			$ -			$ -			$ -
		Y1 Total	$ 53,500.00		Y2 Total	$ 57,500.00		Y3 Total	$ 77,500.00		OY1 Total	$ 65,500.00		OY2 Total	$ -

From: Aleksei Chmura
To: (b)(6)
Cc: (b)(6) Whitney Bagge; Joe Riccardi; Billy Karesh
Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications
Date: Thursday, September 17, 2020 11:38:05 AM
Attachments: DTRA Jordan Budget 28 Aug 2020.xlsx

Dear (b)(6)

Please find our excel file with a breakdown of EcoHealth Alliance costs and with separate tabs for our subcontracts.

Call me anytime, if you have additional questions or need other documents.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 > (office)
(b)(6) (mobile)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 14, 2020, at 11:23, (b)(6) (b)(6) > wrote:

Good morning,

Thank you for documents as they will come in handy. Would you be able to provide an excel breakdown of EHA and subs?

-----Original Message-----
From: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> >
Sent: Wednesday, September 2, 2020 12:34 PM
To: (b)(6)

Y1	Y2	Y3	Y4	Y5	OY2	Base
2	2	2	2	2	$	291,477.26
2	2	2	2	2	$	67,747.18
4	4	4	4	3	$	85,884.88
2	2	2	2	2	$	93,109.09
					Fringe Rate =	36.50%
1	1	1	1	1	$	59,727.47
12	12	12	12	12	$	81,013.16
					Fringe Rate =	36.50%

PRIME Budget	Y1	Y2	Y3	OY2	Total
A. Senior Key Personnel					
Arthur, Kenneth, PI	$ 46,506.23	$ 48,181.85	$ 53,810.46	$ 56,765.86	$ 205,264.40
Arthur, Kenneth, Fringe	$ 17,854.85	$ 18,758.30	$ 20,661.28	$ 21,794.79	$ 78,969.22
Early, Megan, Behavioral Risk Scientist	$ 16,806.80	$ 17,733.84	$ 18,712.14	$ 19,745.18	$ 72,997.96
Early, Megan, Fringe	$ 6,232.74	$ 6,544.38	$ 6,871.60	$ 7,215.18	$ 26,863.84
Collins, Ward, Abdul, Co-Principal Inv	$ 28,928.29	$ 30,029.71	$ 31,362.96	$ 33,140.83	$ 123,461.79
Collins, Ward, Abdul, Fringe	$ 10,563.21	$ 10,961.97	$ 11,615.20	$ 12,096.62	$ 45,136.99
Whitney, Beggie, Modeler	$ 14,050.71	$ 15,007.92	$ 15,821.06	$ 17,412.05	$ 62,291.40
Whitney, Beggie, Fringe	$ 5,356.94	$ 5,544.65	$ 5,822.13	$ 6,113.27	$ 23,175.99
Total Senior Key Personnel	$ 146,056.75	$ 155,779.12	$ 165,547.26	$ 174,725.42	$ 638,253.79
B. Other Personnel					
Omenetto, Emily, Program Coordinator	$ 14,497.05	$ 15,007.47	$ 15,811.41	$ 17,201.70	$ 62,517.64
Omenetto, Emily, Fringe	$ 5,291.95	$ 5,477.73	$ 5,771.17	$ 6,278.62	$ 22,819.46
Research Assistant	$ 53,274.00	$ 54,870.00	$ 56,516.10	$ 58,211.58	$ 222,871.68
RA Fringe	$ 19,447.01	$ 20,030.42	$ 20,631.33	$ 21,250.27	$ 81,358.03
Total Other Personnel	$ 103,853.01	$ 108,385.62	$ 114,830.01	$ 123,268.18	$ 430,366.81
C. Equipment					
Total Equipment	$ -	$ -	$ -	$ -	$ -
D. Travel					
1 Domestic Travel	$ 4,690.69	$ 7,331.69	$ 7,562.50	$ 7,942.69	$ 33,858.69
2 Foreign Travel	$ 31,016.69	$ 31,532.50	$ 32,039.50	$ 32,039.50	$ 134,273.69
Total Travel	$ 35,213.99	$ 38,864.19	$ 39,702.30	$ 39,982.19	$ 168,132.69
E. Participant, Trainee Support Costs					
1 Tuition, Fees, Health Insurance					$ -
2 Stipends					$ -
3 Travel					$ -
4 Subsistence					$ -
5 Other					$ -
Total Participant, Trainee Support Costs	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs					
1 Materials and Supplies	$ 2,346.46	$ 2,417.85	$ 2,317.86	$ 2,317.89	$ 17,415.46
2 Publication Costs	$ -	$ 5,265.00	$ 5,265.00	$ -	$ 10,530.00
3 Consultant Services	$ 1,500.00	$ 500.00	$ 500.00	$ 500.00	$ 3,000.00
4 ADP Computer Services					$ -
5 Subawards, Consortium/Contractual Costs					$ -
UGA	$ 553,234.00	$ 530,319.00	$ 529,647.00	$ 524,524.00	$ 2,577,055.72
Fringe Cost	$ 3,275.17	$ 14,140.97	$ 12,140.97	$ 12,140.97	$ 55,042.05
6 Equipment or Facility Rental, User Fees					$ -
7 Alterations and Renovations					$ -
8 Other					$ -
9 Other					$ -
Total Other Direct Costs	$ 10,346.46	$ 8,017.54	$ 8,017.54	$ 2,817.89	$ 35,945.46
G. Direct Costs, excl Modified Total Direct Costs					
Direct Costs	$ 3,307,287.81	$ 3,513,727.80	$ 3,339,881.36	$ 3,353,665.67	$ 13,514,563.64
Modified Direct Costs					$ -
H. Indirect Costs					
1 Indirect Cost Type	$ 136,336.66	$ 112,439.77	$ 118,869.31	$ 121,797.66	$ 489,383.66
2 Indirect Cost Type	$ 11,995.93	$ 9,029.99	$ 352.38	$ -	$ 12,930.69
I. Total Direct and Indirect Costs					
Direct + Indirect	$ 422,920.69	$ 437,234.69	$ 459,330.23	$ 481,294.20	$ 1,800,780.11
J. Fee					
Fee					
K. Total Costs and Fee					
Total Costs	$ 3,730,208.50	$ 3,951,962.49	$ 3,799,211.59	$ 3,834,959.87	$ 15,315,343.75
Cost Share Terms					
	$ 864,386.84	$ 911,865.65	$ 881,176.15	$ 889,987.39	$ 3,547,416.05

RMS Supplies	Description	Y1	Y2	Y3	OY1	OY2	
Laptop	$ 2,500.00	$ 5,000.00					$ 5,000.00
Desk	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Projector	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 2,400.00
Printer	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 1,749.95
Tablet	$ 349.99	$ 349.99					$ 349.99
Software	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 1,500.00
Computer Mouse	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 250.00
Tablet	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 1,750.00
Hard Drive	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 375.00
TOTALS		$ 6,400.45	$ 1,533.98	$ 1,812.98	$ 2,332.98	$ 1,812.98	$ 13,400.45

Consultant Services	Y1	Y2	Y3	OY1	OY2
Rate	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00
# of Trainings	$ 3,000.00				
TOTAL	$ 3,500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00

Publication Costs	Y1	Y2	Y3	OY1	OY2
Page Charge		$ 5,265.00			
Subscription Rate		$ 5,265.00			
TOTAL	$ -	$ 10,530.00	$ -	$ -	$ -

International Travel						TOTAL
Traveler 1 - William Karesh (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 3,780.00	$ 29,164.00
Traveler 2 - William Karesh (Field)						
Hotel Max Per Diem	$ 584.00	$ 584.00	$ 584.00	$ 584.00	$ 584.00	
Meals and Incidental Expenses Per Diem	$ 472.50	$ 472.50	$ 472.50	$ 472.50	$ 472.50	
Taxi Estimate	$ 285.00	$ 285.00	$ 285.00	$ 285.00	$ 285.00	
Flight Estimate						
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 8,707.50
Traveler 3 - Catherine Machalaba (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$ 2,566	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 31,730.00
Traveler 4 - Catherine Machalaba (Field)						
Hotel Max Per Diem	$ 1,414.00	$ 1,578.30	$ 2,628.00	$ 2,628.30	$ 2,628.00	
Meals and Incidental Expenses Per Diem	$ 997.50	$ 1,395.30	$ 1,995.00	$ 1,995.30	$ 1,995.00	
Taxi Estimate	$ 435.00	$ 870.30	$ 870.00	$ 870.30	$ 870.00	
Flight Estimate						
No. Days	10	10	10	10	10	
No. Trips per Year	1	2	1	2	1	
Total	$ 2,746.50	$ 5,493.30	$ 5,493.00	$ 5,493.30	$ 5,493.00	$ 24,718.90
Traveler 5 - Emily Bogan (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.30	$ 1,968.00	$ 1,968.30	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.30	$ 1,242.00	$ 1,242.30	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 6,415	$ 6,415	$ 6,415	$ 6,415	$ 6,415	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 52,975.00

Traveler 5 - International Conference (IUCN)	Vietnam					
Hotel Max Per Diem	$ 819	$ 819	$ 1,638	$ 1,638	$ 1,638	
Meals and Incidental Expenses Per Diem	$ 480	$ 480	$ 480	$ 480	$ 480	
Taxi Estimate	$ 285.00	$ 285.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 1,493	$ 1,493	$ 2,986	$ 2,986	$ 2,986	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	2	2	2	
Total	$ 2,607.00	$ 2,807.30	$ 5,614.00	$ 5,814.30	$ 5,614.00	$ 22,456.00
Visa Fees	$ 504.00	$ 504.30	$ 504.00	$ 504.30	$ 504.00	$ 2,520.00
Vaccination Costs	$ 850.00					$ 850.00
Conference Registration Fees	$ 500.00	$ 500.30	$ 1,000.00	$ 1,000.30	$ 1,000.00	$ 4,000.00
YEARLY TOTALS	$ 31,016.00	$ 42,542.50	$ 56,869.50	$ 86,849.50	$ 54,473.50	$ 271,101.00
conference			visa			
$ DAILY	520		Jansen	58		

Domestic Travel						TOTAL
Traveler 1 - William Karesh (NY DC)						
Hotel Max Per Diem	$ 512	$ 256	$ 512	$ 512	$ 512	
Meals and Incidental Expenses Per Diem	$ 128	$ 114	$ 128	$ 128	$ 128	
Taxi Estimate	$ 90.00	$ 45.00	$ 90.00	$ 90.00	$ 90.00	
Transportation Estimate	$ 492	$ 156	$ 492	$ 492	$ 492	
No. Days	2	2	2	2	2	
No. Trips per Year	2	1	2	2	2	
Total	$ 1,222.00	$ 614.00	$ 1,222.00	$ 1,222.00	$ 1,222.00	$ 5,499.00
Traveler 2 - Catherine Machalaba (NY DC)						
Hotel Max Per Diem	$ 256	$ 256	$ 256	$ 256	$ 256	
Meals and Incidental Expenses Per Diem	$ 114	$ 114	$ 114	$ 114	$ 114	
Taxi Estimate	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	
Transportation Estimate	$ 196	$ 196	$ 196	$ 196	$ 196	
No. Days	2	2	2	2	2	
No. Trips per Year	1	1	1	1	1	
Total	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 3,055.00
Traveler 3 - Attend no Meeting in VA						
Hotel Max Per Diem	$ 1,024	$ 1,024	$ 1,024	$ 1,024	$ 1,024	
Meals and Incidental Expenses Per Diem	$ 380	$ 380	$ 380	$ 380	$ 380	
Taxi Estimate	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	
Transportation Estimate	$ 1,011	$ 1,011	$ 1,011	$ 1,011	$ 1,011	
No. Days	4	4	4	4	4	
No. Trips per Year	2	2	2	2	2	
Total	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 14,324.00
Traveler 4 - Presenting Domestic Mtg ASTMH (Maryland)						
Hotel Max Per Diem	$	$ 924	$ 924	$ 924	$ 924	
Meals and Incidental Expenses Per Diem	$ -	$ 497	$ 497	$ 497	$ 497	
Taxi Estimate	$ -	$ 210.00	$ 210.00	$ 210.00	$ 210.00	
Transportation Estimate	$ -	$ 684	$ 684	$ 684	$ 684	
No. Days	3	4	4	4	4	
Prep + Attending	3	2	2	2	2	
Total	$ -	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 9,260.00

Conference Registration Fees	$ -	$ 930.00	$ 930.00	$ 930.00	$ 930.00	
YEARLY TOTALS	$ 4,697.80	$ 7,421.80	$ 7,942.80	$ 7,942.80	$ 7,942.80	$ 35,168.00
/month	$ 469.78					

Y1	Y2	Y3	OY1	OY2	Base
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$ [illegible]

Fringe Rate [illegible]

Human Link	Y1	Y2	Y3	OY1	OY2	Total
A. Senior Key Personnel						
[illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
	$	$	$	$	$	$
Total Senior Key Personnel	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
B. Other Personnel						
Total Other Personnel	$	$	$	$	$	$
C. Equipment						
Total Equipment	$	$	$	$ -	$ -	$ -
D. Travel						
1. Domestic Travel						$
2. Foreign Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Total Travel	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$
5. Other						$
Total Participant/Trainee Support Costs	$	$	$	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies		$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Publication Costs						$
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$
6. Equipment or Facility Rental/User Fees						$
7. Alterations and Renovations						$ -
8. [illegible]						$ -
9. Other						$
Total Other Direct Costs	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Modified Direct Costs						$
H. Indirect Costs						
1. Indirect Cost Type	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct + Indirect	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
J. Fee						
Fee						
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

IDC Rate [illegible]		[illegible]				
DC Rate [illegible]						

[illegible]						
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	$	$	$	$	$	
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	
[illegible]	[illegible]	4	8	6	4	
[illegible]	[illegible]	[illegible]	1	1	[illegible]	
Total	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

						JUST	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
12	12	12	12	12	$ 127,940.00	Dr. Ehab Abu-Basha, CoPI	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 639,700.00
						Dr. Ehab Abu-Basha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
8	8	8	8	8	$ 19,301.80	Hani Talafha, Biologist	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 64,339.33
						Hani Talafha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	12	12	12	12	$ 32,520.00	Zaidoun Hijazeen, Veterinarian	$ 5,420.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 135,500.00
						Zaidoun Hijazeen Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 54,391.53	Mustafa Ababneh, Virologist/Lab Director	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 67,989.41
						Mustafa Ababneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2.5	2.5	2.5	2.5	2.5	$ 57,903.18	Zuhair Bani Ismail, Livestock ID Expert	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 60,315.81
						Zuhair Bani Ismail Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 69,597.00	Borhan Al-zoghoul, Molecular Biologist/Lab Director	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 86,996.25
						Borhan Al-zoghoul Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 23,112.00	Bilal Al-Omari, Lab Supervisor	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 28,890.00
						Bilal Al-Omari Fringe	$ -	$ -	$ -	$ -	$ -	$ -
1	1	1	1	1	$ 77,018.63	Wail Hayajneh, Human ID Expert	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 73,757.76
						Wail Hayajneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
			Fringe Rate-->			Total Senior/Key Personnel	$ 209,817.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 1,157,488.57
						B. Other Personnel						
1	1	1	2	2	$ 58,241.66	Saad Gharaibeh, Avian Pathologist	$ 4,853.47	$ 4,853.47	$ 4,853.47	$ 9,706.94	$ 9,706.94	$ 33,974.30
						Saad Gharaibeh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3.5	3.5	3.5	3.5	3.5	$ 28,219.76	Admin	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 41,152.94
						Admin Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	4	4	3	0	$ 47,860.32	Nurses (x2)	$ 15,953.44	$ 31,906.88	$ 31,906.88	$ 23,930.16	$ -	$ 103,697.36
12	12	12	12	12	$ 2,538.84	Undergrad Student: Stipends (x2)	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 25,388.40
12	12	12	12	12	$ 3,385.08	Graduate Student Stipends (x2)	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 33,850.80
			Fringe Rate-->			Total Other Personnel	$ 40,885.34	$ 56,838.78	$ 56,838.78	$ 53,715.53	$ 29,785.37	$ 204,089.50
						C. Equipment						
						Vehicle	$ 37,150.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 44,470.00
						Luminescence plate reader	$ 28,846.00					
						Total Equipment	$ 65,996.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 73,316.00
						D. Travel						
						1. Domestic Travel	$ 40,108.00	$ 62,626.00	$ 62,626.00	$ 51,367.00	$ 12,360.00	$ 229,087.00
						2. Foreign Travel	$ 37,433.50	$ 26,890.00	$ 26,890.00	$ 26,890.00	$ 29,915.50	$ 148,019.00
						Total Travel	$ 77,541.50	$ 89,516.00	$ 89,516.00	$ 78,257.00	$ 42,275.50	$ 377,106.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 36,933.96	$ 18,784.77	$ 7,666.97	$ 10,255.19	$ -	$ 73,640.89
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other - Testing	$ 53,500.00	$ 53,500.00	$ 77,500.00	$ 65,500.00	$ -	$ 250,000.00
						9. Other - Meetings and Conferences	$ 27,589.08	$ 39,205.05	$ 17,366.69	$ 39,205.05	$ 9,885.27	$ 215,251.14
						Total Other Direct Costs	$ 118,023.04	$ 111,489.82	$ 102,533.66	$ 114,960.24	$ 9,885.27	$ 538,892.03
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 512,263.59	$ 496,592.31	$ 487,636.15	$ 485,680.49	$ 402,693.86	$ 2,384,866.40
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate-->	8%		1. Indirect Cost Type	$ 40,981.09	$ 39,727.39	$ 39,010.89	$ 38,854.44	$ 32,215.51	$ 190,789.31
			IDC Rate-->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	$ 2,575,655.72

International Travel						TOTA…
International Conference (1 MED member)						
Hotel Rate Per Diem	$ 3,276	$ 3,276	$ 3,276	$ 3,276	$ 3,276	
Meals and Incidental Expenses Per Diem	$ 1,683	$ 1,683	$ 1,683	$ 1,683	$ 1,683	
Total Per Diem	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	
Flight Estimate	$ 3,192	$ 3,192	$ 3,192	$ 3,192	$ 3,192	
Per Diem	4	4	4	4	4	
No. Trips per Year	4	4	4	4	4	
Total	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 155,670.00
Program Conference (1 MED Member)						
Hotel Rate Per Diem	$ 3,691	$ 3,691	$ 3,691	$ 3,691	$ 3,691	
Meals and Incidental Expenses Per Diem	$ 1,376	$ 1,376	$ 1,376	$ 1,376	$ 1,376	
Total Per Diem	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	
Flight Estimate	$ 3,698	$ 3,698	$ 3,698	$ 3,698	$ 3,698	
Per Diem	4	4	4	4	4	
No. Trips per Year	1	1	1	1	1	
Total	$ 6,529.50	$ 8,700.00	$ 8,700.00	$ 8,700.00	$ 10,882.50	$ 43,530.00
DTRA Mtg (NA						
Hotel Rate Per Diem	$ 1,293	$ 1,293	$ 1,293	$ 1,293	$ 1,293	
Meals and Incidental Expenses Per Diem	$ 426	$ 426	$ 426	$ 426	$ 426	
Total Per Diem	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	
Flight Estimate	$ 1,083	$ 1,083	$ 1,083	$ 1,083	$ 1,083	
Per Diem	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 19,012.50
Foreign Travel (3 days/1 staffer)						
Hotel Rate Per Diem	$ 5,823	$ -	$ -	$ -	$ -	
Meals and Incidental Expenses Per Diem	$ 3,822	$	$	$	$	
Total Per Diem	$ 1,120.00	$	$	$	$	
Flight Estimate	$ 1,340	$	$	$	$	
Per Diem	7	7	7	7	7	
No. Trips per Year	0	0	0	0	0	
Total	$ 13,560.00	$	$	$	$	$ 13,560.00
Conference Fees	$ 4,540.00	$ 5,300.00	$ 5,300.00	$ 5,300.00	$ 5,345.00	$ 26,080.00
Misc Fees	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 2,500.00
YEARLY TOTALS	$ 37,438.50	$ 26,500.00	$ 26,500.00	$ 26,500.00	$ 29,515.50	$ 148,319.00

	Y1	Y2	Y3	Y4	Y5	
Travelers						
Total (Pax)	164	164	164	164	164	820
Unique Travelers (Individuals)	164	164	164	164	164	820
Total Days	824	824	824	824	824	2830
Conferences						
15 @ 300	2000	2000	2000	2000	2000	10000
191 @ 362	2547	2547	2547	1591	1274	10509
Total Conferences	4547	4547	4547	3591	3274	20509

Annual Conference (Y1, OY2)		6 People	4 Days		
Hotel Rate Per Diem	$ 346.00	10	2	$	$ 6,920.00
M&IE Expenses Per Diem	$ 138.00	10	2	$	$ 2,760.00
Domestic Transport	$ 414.00	10	2	$	$ 8,280.00
Foreign/Supplies	$ 249.00	1	2	$	$ 498.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	45	2	$	$ 3,600.00
					$ 32,882.28
Kickoff Meeting (Y2, OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	6	2	$	$ 4,152.00
M&IE Expenses Per Diem	$ 138.00	6	2	$	$ 1,380.00
Domestic Transport	$ 414.00	6	2	$	$ 3,071.88
Foreign/Supplies	$ 69.00	1	2	$	$ 69.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	20	2	$	$ 1,600.00
					$ 19,222.52
Regional Meeting (Y2, OY2 ONLY)		**8 People**	**3 Days**		
Regional Transport - Lyons	$ 390.00	8	3	$	$ 780.00
Regional Transport - Lexington	$ 409.00	8	3	$	$ 818.00
Regional Transport - Paris	$ 453.00	8	3	$	$ 906.00
Hotel Rate Per Diem	$ 346.00	8	3	$	$ 2,076.00
M&IE Expenses Per Diem	$ 138.00	8	3	$	$ 828.00
Translator and Source	$ 1,974.64	1	3	$	$ 5,923.92
Room Rental	$ 1,950.00	1	3	$	$ 5,850.00
Lunch and Coffee	$ 40.00	45	3	$	$ 5,400.00
					$ 23,580.92
Threat Reduction Workshop (OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	20	4	$	$ 27,680.00
M&IE Expenses Per Diem	$ 138.00	10	4	$	$ 5,520.00
Domestic Transport	$ 414.00	10	4	$	$ 8,280.00
Translator and Source	$ 1,974.64	1	4	$	$ 7,898.56
Room Rental	$ 1,950.00	1	4	$	$ 7,800.00
Lunch and Coffee	$ 40.00	45	4	$	$ 7,200.00
Regional Transport - Lyons	$ 390.00	6	1	$	$ 1,560.00
Regional Transport - Paris	$ 453.00	6	1	$	$ 1,812.00
					$ 67,750.56

	Y1	Y2	Y3	OY1	OY2
Individuals and Group Costs	$ 22,500.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 21,000.00

Field Travel Costs	Y1	Y2	Y3	OY1	OY2
Food/Lodging Per Diems	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$
Fuel	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00
Vehicle Maintenance Costs	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Tokens of Appreciation	$ 20,318.00	$ 27,036.00	$ 27,036.00	$ 25,277.00	$ 10,000.00
TOTAL	$ 40,308.00	$ 64,026.00	$ 62,826.00	$ 53,767.00	$ 32,360.00

Food/Lodging Per Diems	Y1	Y2	Y3	OY1	OY2	
# Trips	2	4	4	3	0	
Per Diem	300	300	300	300	300	(3 Host, 2 Travel in Scale 1)
# days	5	5	5	5	5	
# Pax	5	5	5	5	5	
Total	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$	
Tokens of Appreciation - Items	Y1	Y2	Y3	OY1	OY2	
# Samples/ITF	300	300	300	300	300	
# Quarters	2	4	4	3	0	
Sample Size	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	
Price per Item	$ 11.25	$ 11.25	$ 11.25	$ 11.25	$ 11.25	(11 Items per Scale 1)
Total	$ 7,518.00	$ 18,036.00	$ 18,036.00	$ 12,277.00	$	
Tokens of Appreciation - Camo/Patches	Y1	Y2	Y3	OY1	OY2	
# Samples/ QY	50	50	50	50	50	(50 patches of each type on hand
# Quarters	2	2	2	2	2	x 2 QY Quarters, 0 leftovers after 2 yrs)
Price per Sample	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Total	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	

Travel Costs				
	Y1	Y2	Y3	Total
A. Hamilton	7.75	7.75	$ 1.53	$ 26.66
A. Drake	58.2	58.2	$ 1.53	$ 8.90
A. Kent	262	262	$ 1.53	$ 40.06
Mira	438	438	$ 1.53	$ 67.01
Scales	668	668	$ 1.53	$ 102.16
				$ 245.38
	30000	8030	$ 1.53	$ 4,580.00

Field Supplies			Y1		Y2		Y3		OY1		OY2	
Type	Units/Price	Price	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total
Nunc 1.8 internal cryovials	450	$ 516.42	12	$ 6,197.04	17	$ 8,779.14	8	$ 4,131.36	10	$ 5,164.20		
Serum tubes 10 mL	100	31.09	25	$ 777.25	23	$ 715.07	12	$ 373.08	12	$ 373.08		
Serum tubes 3 mL	100	27.31	2	$ 54.62	0	$ -	1	$ 27.31		$ -		
Vacutainer holder	250	$ 20.77	50	$ 1,038.50	50	$ 1,038.50		$ -		$ -		
21g 1in vacutainer safety needles	48	$ 39.92	30	$ 1,197.60	28	$ 1,117.76	15	$ 598.80	14	$ 558.88		
18g 1in vacutainer needles	100	$ 32.19	5	$ 160.95	5	$ 160.95	3	$ 96.57	2	$ 64.38		
3cc luer lock syringe	100	$ 21.80	2	$ 43.60		$	1	$ 21.80		$		
22g 1in needle	100	$ 19.80	2	$ 39.60		$ -	1	$ 19.80		$ -		
Cotton Swabs	500	$ 400.00	5	$ 2,000.00	10	$ 4,000.00	0	$	5	$ 2,000.00		
Gloves	50	$ 29.65	7	$ 207.55	14	$ 415.10	0	$ -	6	$ 177.90	0	$ -
Masks N95	50	$ 47.75	7	$ 334.25	7	$ 334.25	7	$ 334.25	5	$ 238.75	0	$
Tyvek Suits (project supply)	25	$ 350.00	52	$ 18,200.00	0	$ -	0	$ -	0	$ -	0	$ -
Goggles (project supply)	12	$ 135.00	2	$ 270.00	0	$ -	0	$ -	0	$ -	0	$ -
Booties (project supply)	200	$ 300.00	7	$ 2,100.00	0	$ -	0	$ -	0	$ -	0	$ -
Biohazard Bag (project supply)	200	$ 155.00	2	$ 310.00	0	$ -	0	$ -	0	$ -	0	$ -
Sharps Container	20	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00		$ -
Alcohol Swabs	1200	$ 32.00	4	$ 128.00	7	$ 224.00	2	$ 64.00	4	$ 128.00		$ -
Tablets	1	$ 200.00	5	$ 1,000.00		$		$		$		$
Dry Ice	1 week	$ 150.00	6	$ 900.00	12	$ 1,800.00	12	$ 1,800.00	9	$ 1,350.00		$ -
Eye wash station	1	$ 275.00	1	$ 275.00		$		$		$		$
Card reader system		$ 1,500.00	1	$ 1,500.00		$ -		$ -		$ -		$ -
TOTALS				**$ 36,933.96**		**$ 18,784.77**		**$ 7,666.97**		**$ 10,255.19**		**$ -**

Nunc 1.8 internal cryovials	PCRs - 2 swabs/animal or person
Serum tubes 10 mL	1 per human, 2 per animal serology
Serum tubes 3 mL	1 per chicken serology
Vacutainer holder	100
21g 1in vacutainer safety needles	1 per human serology
18g 1in vacutainer needles	1 per camel serology
3cc luer lock syringe	1 per chicken serology
22g 1in needle	1 per chicken serology
Cotton Swabs	PCRs - 2 swabs/animal or person

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
MERS PCR camels	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$ -
A PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
A PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
A PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
MERS Serology Humans PP	330	$ 40.00	$ 13,200.00	0	$ 40.00	$ -	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 13,200.00			
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$ -	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
A serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$ -	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$ -
A serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$
A serology Subtype Tesing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$ -	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$ -
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$ -	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$ -
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$ -	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$ -
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto Serovar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$ -			$ -			$ -			$ -			$ -
Lepto PCR camels			$ -			$ -			$ -			$ -			$ -
Lepto PCR other ruminants			$ -			$ -			$ -			$ -			$ -
			$ -			$ -			$ -			$ -			$ -
		Y1 Total	$ 53,500.00		Y2 Total	$ 51,500.00		Y3 Total	$ 77,500.00		OY1 Total	$ 65,500.00		OY2 Total	$ -

(b)(6)

Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Much appreciated.(b)(6)

I cannot imagine how you get through all these documents. We only have a few proposals/awards to justify and it seems like an enormous task for us!

If I may help you quickly locate certain documents in our forms and files, please call or text my handphone anytime day or night.

Many thanks again!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

(b)(6) (mobile)
Caution-www.ecohealthalliance.org <http://caution-www.ecohealthalliance.org/> <
Caution-http://www.ecohealthalliance.org >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 2, 2020, at 12:17,(b)(6)
(b)(6) > > wrote:

Yes , they were received. Thank you

-----Original Message-----
From: William B. Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> <
Caution-mailto:karesh@ecohealthalliance.org > >
Sent: Wednesday, September 2, 2020 11:16 AM
To:(b)(6)
(b)(6)
Cc: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> <
Caution-mailto:chmura@ecohealthalliance.org > >
Subject: Fwd: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the

authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I just wanted to confirm that you received the email below earlier this week.

Thanks!!

William B. Karesh, D.V.M
Executive Vice President for Health and Policy

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018 USA

+1.212.380.4463 (direct)
+1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

Begin forwarded message:

From:Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> < Caution-mailto:chmura@ecohealthalliance.org > < Caution-Caution-mailto:chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > > >

Subject:Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

Date:August 30, 2020 at 8:14:36 PM EDT

To: (b)(6) < Caution-Caution (b)(6) > >

Cc: (b)(6) < Caution-Caution (b)(6) > >, Billy Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> < Caution-mailto:karesh@ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > > >, Whitney Bagge <bagge@ecohealthalliance.org <mailto:bagge@ecohealthalliance.org> < Caution-mailto:bagge@ecohealthalliance.org > < Caution-Caution-mailto:bagge@ecohealthalliance.org < Caution-mailto:bagge@ecohealthalliance.org > > >, Catherine Machalaba <machalaba@ecohealthalliance.org <mailto:machalaba@ecohealthalliance.org> < Caution-mailto:machalaba@ecohealthalliance.org > < Caution-Caution-mailto:machalaba@ecohealthalliance.org < Caution-mailto:machalaba@ecohealthalliance.org > > >, Joe Riccardi <riccardi@ecohealthalliance.org <mailto:riccardi@ecohealthalliance.org> < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > >

Dear (b)(6)

Please find attached seven files:

1) FRBAA14-6-2-0471_Clarifications_FINAL.xlsx
2) EHA Budget Justification_FINAL.docx
3) EHA Documentation_FINAL.pdf
4) Human Link Budget Justification_FINAL.docx
5) Human Link Documentation_FINAL.pdf
6) JUST Budget Justification_FINAL.docx
7) JUST Documentation_FINAL.pdf

There are three sets of paired files with the requested documentation (PDFs) and track-change budget justifications (MS Word) for EcoHealth Alliance and our two subcontracts under this proposal. We have also included the clarifications (MS Excel) with responses to the specific questions in each tab.

Please let me know, if there are additional questions or any other documentation is required.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 < tel:1.212.380.4469 > > (office)
(b)(6) > (mobile)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-http://www.ecohealthalliance.org/ < caution-Caution-http://www.ecohealthalliance.org/ > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

From: Aleksei Chmura
To: (b)(6)
Cc: (b)(6); Whitney Bagge; Joe Riccardi; Billy Karesh
Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications
Date: Thursday, September 17, 2020 11:38:05 AM
Attachments: DTRA Jordan Budget 28 Aug 2020.xlsx

Dear (b)(6)

Please find our excel file with a breakdown of EcoHealth Alliance costs and with separate tabs for our subcontracts.

Call me anytime, if you have additional questions or need other documents.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 > (office)
(b)(6) (mobile)
Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org/ >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 14, 2020, at 11:23, (b)(6) (b)(6) > wrote:

Good morning,

Thank you for documents as they will come in handy. Would you be able to provide an excel breakdown of EHA and subs?

-----Original Message-----
From: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> >
Sent: Wednesday, September 2, 2020 12:34 PM
To: (b)(6)

Y1	Y2	Y3	Y4	Y5	OY2	Base
2	2	2	2	2	$	291,477.26
2	2	2	2	2	$	67,747.18
4	4	4	4	3	$	85,884.88
2	2	2	2	2	$	93,109.09
					Fringe Rate =	36.50%
1	1	1	1	1	$	59,727.47
12	12	12	12	12	$	81,013.16
					Fringe Rate =	36.50%

PRIME Budget	Y1	Y2	Y3	OY2	Total
A. Senior Key Personnel					
Arthur, Kenneth, PI	$ 46,506.23	$ 48,181.85	$ 53,810.46	$ 56,765.86	$ 205,264.40
Arthur, Kenneth, Fringe	$ 17,854.85	$ 18,758.30	$ 20,661.28	$ 21,794.79	$ 78,969.22
Early, Megan, Behavioral Risk Scientist	$ 16,806.80	$ 17,733.84	$ 18,712.14	$ 19,745.18	$ 72,997.96
Early, Megan, Fringe	$ 6,232.74	$ 6,544.38	$ 6,871.60	$ 7,215.18	$ 26,863.84
Collins, Ward, Abdul, Co-Principal Inv	$ 28,928.29	$ 30,029.71	$ 31,362.96	$ 33,140.83	$ 123,461.79
Collins, Ward, Abdul, Fringe	$ 10,563.21	$ 10,961.97	$ 11,615.20	$ 12,096.62	$ 45,136.99
Whitney, Beggie, Modeler	$ 14,050.71	$ 15,007.92	$ 15,821.06	$ 17,412.05	$ 62,291.40
Whitney, Beggie, Fringe	$ 5,356.94	$ 5,544.65	$ 5,822.13	$ 6,113.27	$ 23,175.99
Total Senior Key Personnel	$ 146,056.75	$ 155,779.12	$ 165,547.26	$ 174,725.42	$ 638,253.79
B. Other Personnel					
Omenetto, Emily, Program Coordinator	$ 14,497.05	$ 15,007.47	$ 15,811.41	$ 17,201.70	$ 62,517.64
Omenetto, Emily, Fringe	$ 5,291.95	$ 5,477.73	$ 5,771.17	$ 6,278.62	$ 22,819.46
Research Assistant	$ 53,274.00	$ 54,870.00	$ 56,516.10	$ 58,211.58	$ 222,871.68
RA Fringe	$ 19,447.01	$ 20,030.42	$ 20,631.33	$ 21,250.27	$ 81,358.03
Total Other Personnel	$ 103,853.01	$ 108,385.62	$ 114,830.01	$ 123,268.18	$ 430,366.81
C. Equipment					
Total Equipment	$ -	$ -	$ -	$ -	$ -
D. Travel					
1 Domestic Travel	$ 4,690.69	$ 7,331.69	$ 7,562.50	$ 7,942.69	$ 33,858.69
2 Foreign Travel	$ 31,016.69	$ 31,532.50	$ 32,039.50	$ 32,039.50	$ 134,273.69
Total Travel	$ 35,213.99	$ 38,864.19	$ 39,702.30	$ 39,982.19	$ 168,132.69
E. Participant, Trainee Support Costs					
1 Tuition, Fees, Health Insurance					$ -
2 Stipends					$ -
3 Travel					$ -
4 Subsistence					$ -
5 Other					$ -
Total Participant, Trainee Support Costs	$ -	$ -	$ -	$ -	$ -
F. Other Direct Costs					
1 Materials and Supplies	$ 2,346.46	$ 2,417.85	$ 2,317.86	$ 2,317.89	$ 17,415.46
2 Publication Costs	$ -	$ 5,265.00	$ 5,265.00	$ -	$ 10,530.00
3 Consultant Services	$ 1,500.00	$ 500.00	$ 500.00	$ 500.00	$ 3,000.00
4 ADP Computer Services					$ -
5 Subawards, Consortium/Contractual Costs					$ -
UGA	$ 553,234.00	$ 530,319.00	$ 529,647.00	$ 524,524.00	$ 2,577,055.72
Fringe Cost	$ 3,275.17	$ 14,140.97	$ 12,140.97	$ 12,140.97	$ 55,042.05
6 Equipment or Facility Rental, User Fees					$ -
7 Alterations and Renovations					$ -
8 Other					$ -
9 Other					$ -
Total Other Direct Costs	$ 10,346.46	$ 8,017.54	$ 8,017.54	$ 2,817.89	$ 35,945.46
G. Direct Costs, excl Modified Total Direct Costs					
Direct Costs	$ 3,307,287.81	$ 3,513,727.80	$ 3,339,881.36	$ 3,353,665.67	$ 13,514,563.64
Modified Direct Costs					$ -
H. Indirect Costs					
1 Indirect Cost Type	$ 136,336.66	$ 112,439.77	$ 118,869.31	$ 121,797.66	$ 489,383.66
2 Indirect Cost Type	$ 11,995.93	$ 9,029.99	$ 352.38	$ -	$ 12,930.69
I. Total Direct and Indirect Costs					
Direct + Indirect	$ 422,920.69	$ 437,234.69	$ 459,330.23	$ 481,294.20	$ 1,800,780.11
J. Fee					
Fee					
K. Total Costs and Fee					
Total Costs	$ 3,730,208.50	$ 3,951,962.49	$ 3,799,211.59	$ 3,834,959.87	$ 15,315,343.75
Cost Share Terms					
	$ 864,386.84	$ 911,865.65	$ 881,176.15	$ 889,987.39	$ 3,547,416.05

RMS Supplies	Description	Y1	Y2	Y3	OY1	OY2	
Laptop	$ 2,500.00	$ 5,000.00					$ 5,000.00
Desk	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Projector	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 400.00	$ 2,400.00
Printer	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 349.99	$ 1,749.95
Tablet	$ 349.99	$ 349.99					$ 349.99
Software	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 300.00	$ 1,500.00
Computer Mouse	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 250.00
Tablet	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 1,750.00
Hard Drive	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 375.00
TOTALS		$ 6,400.45	$ 1,533.98	$ 1,812.98	$ 2,332.98	$ 1,812.98	$ 13,400.45

Consultant Services	Y1	Y2	Y3	OY1	OY2
Rate	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00
# of Trainings	$ 3,000.00				
TOTAL	$ 3,500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00

Publication Costs	Y1	Y2	Y3	OY1	OY2
Page Charge		$ 5,265.00			
Subscription Rate		$ 5,265.00			
TOTAL	$ -	$ 10,530.00	$ -	$ -	$ -

International Travel						TOTAL
Traveler 1 - William Karesh (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 3,780.00	$ 29,164.00
Traveler 2 - William Karesh (Field)						
Hotel Max Per Diem	$ 584.00	$ 584.00	$ 584.00	$ 584.00	$ 584.00	
Meals and Incidental Expenses Per Diem	$ 472.50	$ 472.50	$ 472.50	$ 472.50	$ 472.50	
Taxi Estimate	$ 285.00	$ 285.00	$ 285.00	$ 285.00	$ 285.00	
Flight Estimate						
No. Days	5	5	5	5	5	
No. Trips per Year	1	1	1	1	1	
Total	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 1,341.50	$ 8,707.50
Traveler 3 - Catherine Machalaba (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.00	$ 570.00	$ 570.00	$ 570.00	
Flight Estimate	$ 2,566	$ 2,566	$ 2,566	$ 2,566	$ 2,566	
No. Days	5	5	5	5	5	
No. Trips per Year	2	2	2	2	2	
Total	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 6,346.00	$ 31,730.00
Traveler 4 - Catherine Machalaba (Field)						
Hotel Max Per Diem	$ 1,414.00	$ 1,578.30	$ 2,628.00	$ 2,628.30	$ 2,628.00	
Meals and Incidental Expenses Per Diem	$ 997.50	$ 1,395.30	$ 1,995.00	$ 1,995.30	$ 1,995.00	
Taxi Estimate	$ 435.00	$ 870.30	$ 870.00	$ 870.30	$ 870.00	
Flight Estimate						
No. Days	10	10	10	10	10	
No. Trips per Year	1	2	1	2	1	
Total	$ 2,746.50	$ 5,493.30	$ 5,493.00	$ 5,493.30	$ 5,493.00	$ 24,718.90
Traveler 5 - Emily Bogan (Animal)						
Hotel Max Per Diem	$ 1,968.00	$ 1,968.30	$ 1,968.00	$ 1,968.30	$ 1,968.00	
Meals and Incidental Expenses Per Diem	$ 1,242.00	$ 1,242.30	$ 1,242.00	$ 1,242.30	$ 1,242.00	
Taxi Estimate	$ 570.00	$ 570.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 6,415	$ 6,415	$ 6,415	$ 6,415	$ 6,415	
No. Days	5	5	5	5	5	
No. Trips per Year	1	2	1	2	1	
Total	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 10,195.30	$ 10,195.00	$ 52,975.00

Traveler 5 - International Conference (IUCN)	Vietnam					
Hotel Max Per Diem	$ 819	$ 819	$ 1,638	$ 1,638	$ 1,638	
Meals and Incidental Expenses Per Diem	$ 480	$ 480	$ 480	$ 480	$ 480	
Taxi Estimate	$ 285.00	$ 285.30	$ 570.00	$ 570.30	$ 570.00	
Flight Estimate	$ 1,493	$ 1,493	$ 2,986	$ 2,986	$ 2,986	
No. Days	4	4	4	4	4	
No. Trips per Year	1	1	2	2	2	
Total	$ 2,607.00	$ 2,807.30	$ 5,614.00	$ 5,814.30	$ 5,614.00	$ 22,456.00
Visa Fees	$ 504.00	$ 504.30	$ 504.00	$ 504.30	$ 504.00	$ 2,520.00
Vaccination Costs	$ 850.00					$ 850.00
Conference Registration Fees	$ 500.00	$ 500.30	$ 1,000.00	$ 1,000.30	$ 1,000.00	$ 4,000.00
YEARLY TOTALS	$ 31,016.00	$ 42,542.50	$ 56,869.50	$ 86,849.50	$ 54,473.50	$ 271,101.00
conference			visa			
$ DAILY	520		Jansen	58		

Domestic Travel						TOTAL
Traveler 1 - William Karesh (NY DC)						
Hotel Max Per Diem	$ 512	$ 256	$ 512	$ 512	$ 512	
Meals and Incidental Expenses Per Diem	$ 128	$ 114	$ 128	$ 128	$ 128	
Taxi Estimate	$ 90.00	$ 45.00	$ 90.00	$ 90.00	$ 90.00	
Transportation Estimate	$ 492	$ 156	$ 492	$ 492	$ 492	
No. Days	2	2	2	2	2	
No. Trips per Year	2	1	2	2	2	
Total	$ 1,222.00	$ 614.00	$ 1,222.00	$ 1,222.00	$ 1,222.00	$ 5,499.00
Traveler 2 - Catherine Machalaba (NY DC)						
Hotel Max Per Diem	$ 256	$ 256	$ 256	$ 256	$ 256	
Meals and Incidental Expenses Per Diem	$ 114	$ 114	$ 114	$ 114	$ 114	
Taxi Estimate	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	
Transportation Estimate	$ 196	$ 196	$ 196	$ 196	$ 196	
No. Days	2	2	2	2	2	
No. Trips per Year	1	1	1	1	1	
Total	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 611.00	$ 3,055.00
Traveler 3 - Attend no Meeting in VA						
Hotel Max Per Diem	$ 1,024	$ 1,024	$ 1,024	$ 1,024	$ 1,024	
Meals and Incidental Expenses Per Diem	$ 380	$ 380	$ 380	$ 380	$ 380	
Taxi Estimate	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	
Transportation Estimate	$ 1,011	$ 1,011	$ 1,011	$ 1,011	$ 1,011	
No. Days	4	4	4	4	4	
No. Trips per Year	2	2	2	2	2	
Total	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 2,864.80	$ 14,324.00
Traveler 4 - Presenting Domestic Mtg ASTMH (Maryland)						
Hotel Max Per Diem	$	$ 924	$ 924	$ 924	$ 924	
Meals and Incidental Expenses Per Diem	$ -	$ 497	$ 497	$ 497	$ 497	
Taxi Estimate	$ -	$ 210.00	$ 210.00	$ 210.00	$ 210.00	
Transportation Estimate	$ -	$ 684	$ 684	$ 684	$ 684	
No. Days	3	4	4	4	4	
Prep + Attending	3	2	2	2	2	
Total	$ -	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 2,315.00	$ 9,260.00

Conference Registration Fees	$ -	$ 930.00	$ 930.00	$ 930.00	$ 930.00	
YEARLY TOTALS	$ 4,697.80	$ 7,421.80	$ 7,942.80	$ 7,942.80	$ 7,942.80	$ 35,168.00
/month	$ 469.78					

Y1	Y2	Y3	OY1	OY2	Base
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$ [illegible]

Fringe Rate [illegible]

IDC Rate	[illegible]	[illegible]
DC Rate	[illegible]	

Human Link	Y1	Y2	Y3	OY1	OY2	Total
A. Senior Key Personnel						
Graduate/Postdoc Participant	$ 7,770.17	$ 7,770.17	$ 7,770.17	$ 7,705.00	$ 7,705.00	$ [illegible]
	$	$	$	$	$	$
Total Senior Key Personnel	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
B. Other Personnel						
Total Other Personnel	$	$	$	$	$	$
C. Equipment						
Total Equipment	$	$	$	$	$ -	$ -	$ -
D. Travel						
1. Domestic Travel						$
2. Foreign Travel	$	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 12,588.00
Total Travel	$	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 3,147.00	$ 12,588.00
E. Participant/Trainee Support Costs						
1. Tuition/Fees/Health Insurance						$
2. Stipends						$ -
3. Travel						$ -
4. Subsistence						$
5. Other						$
Total Participant/Trainee Support Costs	$	$	$	$ -	$ -	$ -
F. Other Direct Costs						
1. Materials and Supplies		$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ [illegible]
2. Publication Costs						$
3. Consultant Services						$ -
4. ADP/Computer Services						$ -
5. Subawards/Consortium/Contractual Costs						$
6. Equipment or Facility Rental/User Fees						$
7. Alterations and Renovations						$ -
8. Other/Meetings						$ -
9. Other						$
Total Other Direct Costs	$	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 8,000.00
G. Direct Costs and Modified Direct Costs						
Direct Costs	$ 7,770.17	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
Modified Direct Costs						$
H. Indirect Costs						
1. Indirect Cost Type	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
2. Indirect Cost Type						$
I. Total Direct and Indirect Costs						
Direct + Indirect	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
J. Fee						
Fee						
K. Total Costs and Fee						
Total Costs	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

[illegible]					
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
[illegible]	$	$		$	$
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	$	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]

						JUST	Y1	Y2	Y3	OY1	OY2	Total
Y1	Y2	Y3	OY1	OY2	Base	A. Senior/Key Personnel						
12	12	12	12	12	$ 127,940.00	Dr. Ehab Abu-Basha, CoPI	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 127,940.00	$ 639,700.00
						Dr. Ehab Abu-Basha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
8	8	8	8	8	$ 19,301.80	Hani Talafha, Biologist	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 12,867.87	$ 64,339.33
						Hani Talafha Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	12	12	12	12	$ 32,520.00	Zaidoun Hijazeen, Veterinarian	$ 5,420.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 32,520.00	$ 135,500.00
						Zaidoun Hijazeen Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 54,391.53	Mustafa Ababneh, Virologist/Lab Director	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 13,597.88	$ 67,989.41
						Mustafa Ababneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2.5	2.5	2.5	2.5	2.5	$ 57,903.18	Zuhair Bani Ismail, Livestock ID Expert	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 12,063.16	$ 60,315.81
						Zuhair Bani Ismail Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 69,597.00	Borhan Al-zoghoul, Molecular Biologist/Lab Director	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 17,399.25	$ 86,996.25
						Borhan Al-zoghoul Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3	3	3	3	3	$ 23,112.00	Bilal Al-Omari, Lab Supervisor	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 5,778.00	$ 28,890.00
						Bilal Al-Omari Fringe	$ -	$ -	$ -	$ -	$ -	$ -
1	1	1	1	1	$ 77,018.63	Wail Hayajneh, Human ID Expert	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 14,751.55	$ 73,757.76
						Wail Hayajneh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
			Fringe Rate-->			Total Senior/Key Personnel	$ 209,817.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 236,917.71	$ 1,157,488.57
						B. Other Personnel						
1	1	1	2	2	$ 58,241.66	Saad Gharaibeh, Avian Pathologist	$ 4,853.47	$ 4,853.47	$ 4,853.47	$ 9,706.94	$ 9,706.94	$ 33,974.30
						Saad Gharaibeh Fringe	$ -	$ -	$ -	$ -	$ -	$ -
3.5	3.5	3.5	3.5	3.5	$ 28,219.76	Admin	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 8,230.59	$ 41,152.94
						Admin Fringe	$ -	$ -	$ -	$ -	$ -	$ -
2	4	4	3	0	$ 47,860.32	Nurses (x2)	$ 15,953.44	$ 31,906.88	$ 31,906.88	$ 23,930.16	$ -	$ 103,697.36
12	12	12	12	12	$ 2,538.84	Undergrad Student: Stipends (x2)	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 5,077.68	$ 25,388.40
12	12	12	12	12	$ 3,385.08	Graduate Student Stipends (x2)	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 6,770.16	$ 33,850.80
			Fringe Rate-->			Total Other Personnel	$ 40,885.34	$ 56,838.78	$ 56,838.78	$ 53,715.53	$ 29,785.37	$ 204,089.50
						C. Equipment						
						Vehicle	$ 37,150.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 44,470.00
						Luminescence plate reader	$ 28,846.00					
						Total Equipment	$ 65,996.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 1,830.00	$ 73,316.00
						D. Travel						
						1. Domestic Travel	$ 40,108.00	$ 62,626.00	$ 62,626.00	$ 51,367.00	$ 12,360.00	$ 229,087.00
						2. Foreign Travel	$ 37,433.50	$ 26,890.00	$ 26,890.00	$ 26,890.00	$ 29,915.50	$ 148,019.00
						Total Travel	$ 77,541.50	$ 89,516.00	$ 89,516.00	$ 78,257.00	$ 42,275.50	$ 377,106.00
						E. Participant/Trainee Support Costs						
						1. Tuition/Fees/Health Insurance						$ -
						2. Stipends						$ -
						3. Travel						$ -
						4. Subsistence						$ -
						5. Other						$ -
						Total Participant/Trainee Support Costs	$ -	$ -	$ -	$ -	$ -	$ -
						F. Other Direct Costs						
						1. Materials and Supplies	$ 36,933.96	$ 18,784.77	$ 7,666.97	$ 10,255.19	$ -	$ 73,640.89
						2. Publication Costs						$ -
						3. Consultant Services						$ -
						4. ADP/Computer Services						$ -
						5. Subawards/Consortium/Contractual Costs						$ -
						6. Equipment or Facility Rental/User Fees						$ -
						7. Alterations and Renovations						$ -
						8. Other - Testing	$ 53,500.00	$ 53,500.00	$ 77,500.00	$ 65,500.00	$ -	$ 250,000.00
						9. Other - Meetings and Conferences	$ 27,589.08	$ 39,205.05	$ 17,366.69	$ 39,205.05	$ 9,885.27	$ 215,251.14
						Total Other Direct Costs	$ 118,023.04	$ 111,489.82	$ 102,533.66	$ 114,960.24	$ 9,885.27	$ 538,892.03
						G. Direct Costs and Modified Direct Costs						
						Direct Costs	$ 512,263.59	$ 496,592.31	$ 487,636.15	$ 485,680.49	$ 402,693.86	$ 2,384,866.40
						Modified Direct Costs						$ -
						H. Indirect Costs						
			IDC Rate-->	8%		1. Indirect Cost Type	$ 40,981.09	$ 39,727.39	$ 39,010.89	$ 38,854.44	$ 32,215.51	$ 190,789.31
			IDC Rate-->			2. Indirect Cost Type						$ -
						I. Total Direct and Indirect Costs						
						Direct + Indirect	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	
						J. Fee						
						Fee						
						K. Total Costs and Fee						
						Total Costs	$ 553,244.68	$ 536,319.70	$ 526,647.05	$ 524,534.92	$ 434,909.36	$ 2,575,655.72

International Travel						TOTA…
International Conference (1 MED member)						
Hotel Rate Per Diem	$ 3,276	$ 3,276	$ 3,276	$ 3,276	$ 3,276	
Meals and Incidental Expenses Per Diem	$ 1,683	$ 1,683	$ 1,683	$ 1,683	$ 1,683	
Total Per Diem	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	$ 4,959.00	
Flight Estimate	$ 3,192	$ 3,192	$ 3,192	$ 3,192	$ 3,192	
Per Diem	4	4	4	4	4	
No. Trips per Year	4	4	4	4	4	
Total	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 31,134.00	$ 155,670.00
Program Conference (1 MED Member)						
Hotel Rate Per Diem	$ 3,691	$ 3,691	$ 3,691	$ 3,691	$ 3,691	
Meals and Incidental Expenses Per Diem	$ 1,376	$ 1,376	$ 1,376	$ 1,376	$ 1,376	
Total Per Diem	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	$ 5,067.00	
Flight Estimate	$ 3,698	$ 3,698	$ 3,698	$ 3,698	$ 3,698	
Per Diem	4	4	4	4	4	
No. Trips per Year	1	1	1	1	1	
Total	$ 6,529.50	$ 8,700.00	$ 8,700.00	$ 8,700.00	$ 10,882.50	$ 43,530.00
DTRA Mtg (NA						
Hotel Rate Per Diem	$ 1,293	$ 1,293	$ 1,293	$ 1,293	$ 1,293	
Meals and Incidental Expenses Per Diem	$ 426	$ 426	$ 426	$ 426	$ 426	
Total Per Diem	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	$ 1,719.00	
Flight Estimate	$ 1,083	$ 1,083	$ 1,083	$ 1,083	$ 1,083	
Per Diem	6	6	6	6	6	
No. Trips per Year	1	1	1	1	1	
Total	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 3,802.50	$ 19,012.50
Foreign Travel (3 days/1 staffer)						
Hotel Rate Per Diem	$ 5,823	$ -	$ -	$ -	$ -	
Meals and Incidental Expenses Per Diem	$ 3,822	$	$	$	$	
Total Per Diem	$ 1,120.00	$	$	$	$	
Flight Estimate	$ 1,340	$	$	$	$	
Per Diem	7	7	7	7	7	
No. Trips per Year	0	0	0	0	0	
Total	$ 13,560.00	$	$	$	$	$ 13,560.00
Conference Fees	$ 4,540.00	$ 5,300.00	$ 5,300.00	$ 5,300.00	$ 5,345.00	$ 26,080.00
Misc Fees	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 2,500.00
YEARLY TOTALS	$ 37,438.50	$ 26,500.00	$ 26,500.00	$ 26,500.00	$ 29,515.50	$ 148,319.00

	Y1	Y2	Y3	Y4	Y5	
Travelers						
Total (Pax)	164	164	164	164	164	820
Unique Travelers (Individuals)	164	164	164	164	164	820
Total Days	824	824	824	824	824	2830
Conferences						
15 @ 300	2000	2000	2000	2000	2000	10000
191 @ 362	2547	2547	2547	1591	1274	10509
Total Conferences	4547	4547	4547	3591	3274	20509

Annual Conference (Y1, OY2)		6 People	4 Days		
Hotel Rate Per Diem	$ 346.00	10	2	$	$ 6,920.00
M&IE Expenses Per Diem	$ 138.00	10	2	$	$ 2,760.00
Domestic Transport	$ 414.00	10	2	$	$ 8,280.00
Foreign/Supplies	$ 249.00	1	2	$	$ 498.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	45	2	$	$ 3,600.00
					$ 32,882.28
Kickoff Meeting (Y2, OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	6	2	$	$ 4,152.00
M&IE Expenses Per Diem	$ 138.00	6	2	$	$ 1,380.00
Domestic Transport	$ 414.00	6	2	$	$ 3,071.88
Foreign/Supplies	$ 69.00	1	2	$	$ 69.00
Translator and Source	$ 1,974.64	1	2	$	$ 3,974.64
Room Rental	$ 1,950.00	1	2	$	$ 3,950.00
Lunch and Coffee	$ 40.00	20	2	$	$ 1,600.00
					$ 19,222.52
Regional Meeting (Y2, OY2 ONLY)		**8 People**	**3 Days**		
Regional Transport - Lyons	$ 390.00	8	3	$	$ 780.00
Regional Transport - Lexington	$ 409.00	8	3	$	$ 818.00
Regional Transport - Paris	$ 453.00	8	3	$	$ 906.00
Hotel Rate Per Diem	$ 346.00	8	3	$	$ 2,076.00
M&IE Expenses Per Diem	$ 138.00	8	3	$	$ 828.00
Translator and Source	$ 1,974.64	1	3	$	$ 5,923.92
Room Rental	$ 1,950.00	1	3	$	$ 5,850.00
Lunch and Coffee	$ 40.00	45	3	$	$ 5,400.00
					$ 23,580.92
Threat Reduction Workshop (OY2)		**6 People**	**4 Days**		
Hotel Rate Per Diem	$ 346.00	20	4	$	$ 27,680.00
M&IE Expenses Per Diem	$ 138.00	10	4	$	$ 5,520.00
Domestic Transport	$ 414.00	10	4	$	$ 8,280.00
Translator and Source	$ 1,974.64	1	4	$	$ 7,898.56
Room Rental	$ 1,950.00	1	4	$	$ 7,800.00
Lunch and Coffee	$ 40.00	45	4	$	$ 7,200.00
Regional Transport - Lyons	$ 390.00	6	1	$	$ 1,560.00
Regional Transport - Paris	$ 453.00	6	1	$	$ 1,812.00
					$ 67,750.56

	Y1	Y2	Y3	OY1	OY2
Individuals and Group Costs	$ 22,500.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 21,000.00

Field Travel Costs	Y1	Y2	Y3	OY1	OY2
Food/Lodging Per Diems	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$
Fuel	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00	$ 4,990.00
Vehicle Maintenance Costs	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00
Tokens of Appreciation	$ 20,318.00	$ 27,036.00	$ 27,036.00	$ 25,277.00	$ 10,000.00
TOTAL	$ 40,308.00	$ 64,026.00	$ 62,826.00	$ 53,767.00	$ 32,360.00

Food/Lodging Per Diems	Y1	Y2	Y3	OY1	OY2	
# Trips	2	4	4	3	0	
Per Diem	300	300	300	300	300	(3 Host, 2 Travel in Scale 1)
# days	5	5	5	5	5	
# Pax	5	5	5	5	5	
Total	$ 15,000.00	$ 30,000.00	$ 30,000.00	$ 22,500.00	$	
Tokens of Appreciation - Items	Y1	Y2	Y3	OY1	OY2	
# Samples/ITF	300	300	300	300	300	
# Quarters	2	4	4	3	0	
Sample Size	$ 1.25	$ 1.25	$ 1.25	$ 1.25	$ 1.25	
Price per Item	$ 11.25	$ 11.25	$ 11.25	$ 11.25	$ 11.25	(11 Items per Scale 1)
Total	$ 7,518.00	$ 18,036.00	$ 18,036.00	$ 12,277.00	$	
Tokens of Appreciation - Camo/Patches	Y1	Y2	Y3	OY1	OY2	
# Samples/ QY	50	50	50	50	50	(50 patches of each type on hand
# Quarters	2	2	2	2	2	x 2 QY Quarters, 0 leftovers after 2 yrs)
Price per Sample	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	
Total	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	

Travel Costs				
	Y1	Y2	Y3	Total
A. Hamilton	7.75	7.75	$ 1.53	$ 26.66
A. Drake	58.2	58.2	$ 1.53	$ 8.90
A. Kent	262	262	$ 1.53	$ 40.06
Mira	438	438	$ 1.53	$ 67.01
Scales	668	668	$ 1.53	$ 102.16
				$ 245.38
	30000	8030	$ 1.53	$ 4,580.00

Field Supplies			Y1		Y2		Y3		OY1		OY2	
Type	Units/Price	Price	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total	Qty Needed	Total
Nunc 1.8 internal cryovials	450	$ 516.42	12	$ 6,197.04	17	$ 8,779.14	8	$ 4,131.36	10	$ 5,164.20		
Serum tubes 10 mL	100	31.09	25	$ 777.25	23	$ 715.07	12	$ 373.08	12	$ 373.08		
Serum tubes 3 mL	100	27.31	2	$ 54.62	0	$ -	1	$ 27.31		$ -		
Vacutainer holder	250	$ 20.77	50	$ 1,038.50	50	$ 1,038.50		$ -		$ -		
21g 1in vacutainer safety needles	48	$ 39.92	30	$ 1,197.60	28	$ 1,117.76	15	$ 598.80	14	$ 558.88		
18g 1in vacutainer needles	100	$ 32.19	5	$ 160.95	5	$ 160.95	3	$ 96.57	2	$ 64.38		
3cc luer lock syringe	100	$ 21.80	2	$ 43.60		$	1	$ 21.80		$		
22g 1in needle	100	$ 19.80	2	$ 39.60		$ -	1	$ 19.80		$ -		
Cotton Swabs	500	$ 400.00	5	$ 2,000.00	10	$ 4,000.00	0	$	5	$ 2,000.00		
Gloves	50	$ 29.65	7	$ 207.55	14	$ 415.10	0	$ -	6	$ 177.90	0	$ -
Masks N95	50	$ 47.75	7	$ 334.25	7	$ 334.25	7	$ 334.25	5	$ 238.75	0	$
Tyvek Suits (project supply)	25	$ 350.00	52	$ 18,200.00	0	$ -	0	$ -	0	$ -	0	$ -
Goggles (project supply)	12	$ 135.00	2	$ 270.00	0	$ -	0	$ -	0	$ -	0	$ -
Booties (project supply)	200	$ 300.00	7	$ 2,100.00	0	$ -	0	$ -	0	$ -	0	$ -
Biohazard Bag (project supply)	200	$ 155.00	2	$ 310.00	0	$ -	0	$ -	0	$ -	0	$ -
Sharps Container	20	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00	1	$ 200.00		$ -
Alcohol Swabs	1200	$ 32.00	4	$ 128.00	7	$ 224.00	2	$ 64.00	4	$ 128.00		$ -
Tablets	1	$ 200.00	5	$ 1,000.00		$		$		$		$
Dry Ice	1 week	$ 150.00	6	$ 900.00	12	$ 1,800.00	12	$ 1,800.00	9	$ 1,350.00		$ -
Eye wash station	1	$ 275.00	1	$ 275.00		$		$		$		$
Card reader system		$ 1,500.00	1	$ 1,500.00		$ -		$ -		$ -		$ -
TOTALS				**$ 36,933.96**		**$ 18,784.77**		**$ 7,666.97**		**$ 10,255.19**		**$ -**

Nunc 1.8 internal cryovials	PCRs - 2 swabs/animal or person
Serum tubes 10 mL	1 per human, 2 per animal serology
Serum tubes 3 mL	1 per chicken serology
Vacutainer holder	100
21g 1in vacutainer safety needles	1 per human serology
18g 1in vacutainer needles	1 per camel serology
3cc luer lock syringe	1 per chicken serology
22g 1in needle	1 per chicken serology
Cotton Swabs	PCRs - 2 swabs/animal or person

	YEAR 1			YEAR 2			YEAR 3			OPTION YEAR 1			OPTION YEAR 2		
TESTS	# Y1	Price	Total	# Y2	Price	Total	# Y3	Price	Total	# OY1	Price	Total	# OY2	Price	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
MERS PCR camels	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$ -
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$ -
A PCR Humans	600	$ 15.00	$ 9,000.00	1200	$ 15.00	$ 18,000.00	1200	$ 15.00	$ 18,000.00	900	$ 15.00	$ 13,500.00		$ 15.00	$ -
A PCR poultry	200	$ 15.00	$ 3,000.00	400	$ 15.00	$ 6,000.00	400	$ 15.00	$ 6,000.00	300	$ 15.00	$ 4,500.00		$ 15.00	$
A PCR Sequencing of positives	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00	20	$ 100.00	$ 2,000.00		$ 100.00	$
MERS Serology Humans PP	330	$ 40.00	$ 13,200.00	0	$ 40.00	$ -	330	$ 40.00	$ 13,200.00	330	$ 40.00	$ 13,200.00			
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00	0	$ 15.00	$ -	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
A serology humans	300	$ 6.00	$ 1,800.00	0	$ 6.00	$ -	300	$ 6.00	$ 1,800.00	300	$ 6.00	$ 1,800.00		$ 6.00	$ -
A serology poultry	100	$ 6.00	$ 600.00	0	$ 6.00	$	100	$ 6.00	$ 600.00	100	$ 6.00	$ 600.00		$ 6.00	$
A serology Subtype Tesing	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00	100	$ 15.00	$ 1,500.00		$ 15.00	$ -
Brucella serology humans	300	$ 1.00	$ 300.00	0	$ 1.00	$ -	300	$ 1.00	$ 300.00	300	$ 1.00	$ 300.00		$ 1.00	$ -
Brucella serology camels	100	$ 1.00	$ 100.00	0	$ 1.00	$ -	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$ -
Brucella serology other ruminants	100	$ 1.00	$ 100.00	0	$ 1.00	$	100	$ 1.00	$ 100.00	100	$ 1.00	$ 100.00		$ 1.00	$
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00	0	$ 10.00	$	100	$ 10.00	$ 1,000.00	100	$ 10.00	$ 1,000.00	0	$ 10.00	$
Lepto serology humans	400	$ 8.00	$ 3,200.00	0	$ 8.00	$ -	400	$ 8.00	$ 3,200.00	400	$ 8.00	$ 3,200.00		$ 8.00	$ -
Lepto serology camels	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto serology other ruminants	100	$ 8.00	$ 800.00	0	$ 8.00	$ -	100	$ 8.00	$ 800.00	100	$ 8.00	$ 800.00		$ 8.00	$ -
Lepto Serovar Test	60	$ 10.00	$ 600.00	0	$ 10.00	$	60	$ 10.00	$ 600.00	60	$ 10.00	$ 600.00	0	$ 10.00	$
Lepto PCR humans			$ -			$ -			$ -			$ -			$ -
Lepto PCR camels			$ -			$ -			$ -			$ -			$ -
Lepto PCR other ruminants			$ -			$ -			$ -			$ -			$ -
			$ -			$ -			$ -			$ -			$ -
		Y1 Total	$ 53,500.00		Y2 Total	$ 51,500.00		Y3 Total	$ 77,500.00		OY1 Total	$ 65,500.00		OY2 Total	$ -

(b)(6)

Subject: Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Much appreciated.(b)(6)

I cannot imagine how you get through all these documents. We only have a few proposals/awards to justify and it seems like an enormous task for us!

If I may help you quickly locate certain documents in our forms and files, please call or text my handphone anytime day or night.

Many thanks again!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

(b)(6) (mobile)
Caution-www.ecohealthalliance.org <http://caution-www.ecohealthalliance.org/> <
Caution-http://www.ecohealthalliance.org >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Sep 2, 2020, at 12:17,(b)(6)
(b)(6) > wrote:

Yes , they were received. Thank you

-----Original Message-----
From: William B. Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> <
Caution-mailto:karesh@ecohealthalliance.org > >
Sent: Wednesday, September 2, 2020 11:16 AM
To:(b)(6)
(b)(6)
Cc: Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> <
Caution-mailto:chmura@ecohealthalliance.org > >
Subject: Fwd: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the

authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I just wanted to confirm that you received the email below earlier this week.

Thanks!!

William B. Karesh, D.V.M
Executive Vice President for Health and Policy

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018 USA

+1.212.380.4463 (direct)
+1.212.380.4465 (fax)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > >

President, OIE Working Group on Wildlife

Co-chair, IUCN Species Survival Commission - Wildlife Health Specialist Group

EPT Partners Liaison, USAID Emerging Pandemic Threats - PREDICT-2 Program

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

Begin forwarded message:

From:Aleksei Chmura <chmura@ecohealthalliance.org <mailto:chmura@ecohealthalliance.org> < Caution-mailto:chmura@ecohealthalliance.org > < Caution-Caution-mailto:chmura@ecohealthalliance.org < Caution-mailto:chmura@ecohealthalliance.org > > >

Subject:Re: [Non-DoD Source] FRBA14-6-2-0471 Clarifications

Date:August 30, 2020 at 8:14:36 PM EDT

To: (b)(6) < Caution-Caution (b)(6) > >

Cc (b)(6) < Caution-Caution (b)(6) > >, Billy Karesh <karesh@ecohealthalliance.org <mailto:karesh@ecohealthalliance.org> < Caution-mailto:karesh@ecohealthalliance.org > < Caution-Caution-mailto:karesh@ecohealthalliance.org < Caution-mailto:karesh@ecohealthalliance.org > > >, Whitney Bagge <bagge@ecohealthalliance.org <mailto:bagge@ecohealthalliance.org> < Caution-mailto:bagge@ecohealthalliance.org > < Caution-Caution-mailto:bagge@ecohealthalliance.org < Caution-mailto:bagge@ecohealthalliance.org > > >, Catherine Machalaba <machalaba@ecohealthalliance.org <mailto:machalaba@ecohealthalliance.org> < Caution-mailto:machalaba@ecohealthalliance.org > < Caution-Caution-mailto:machalaba@ecohealthalliance.org < Caution-mailto:machalaba@ecohealthalliance.org > > >, Joe Riccardi <riccardi@ecohealthalliance.org <mailto:riccardi@ecohealthalliance.org> < Caution-mailto:riccardi@ecohealthalliance.org > < Caution-Caution-mailto:riccardi@ecohealthalliance.org < Caution-mailto:riccardi@ecohealthalliance.org > > >

Dear (b)(6)

Please find attached seven files:

1) FRBAA14-6-2-0471_Clarifications_FINAL.xlsx
2) EHA Budget Justification_FINAL.docx
3) EHA Documentation_FINAL.pdf
4) Human Link Budget Justification_FINAL.docx
5) Human Link Documentation_FINAL.pdf
6) JUST Budget Justification_FINAL.docx
7) JUST Documentation_FINAL.pdf

There are three sets of paired files with the requested documentation (PDFs) and track-change budget justifications (MS Word) for EcoHealth Alliance and our two subcontracts under this proposal. We have also included the clarifications (MS Excel) with responses to the specific questions in each tab.

Please let me know, if there are additional questions or any other documentation is required.

Many thanks!

-Aleksei

Aleksei Chmura, PhD
Chief of Staff &
Authorized Organizational Representative

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 < tel:1.212.380.4469 > > (office)
(b)(6) (mobile)
Caution-Caution-www.ecohealthalliance.org <http://caution-caution-www.ecohealthalliance.org/> < Caution-http://caution-Caution-www.ecohealthalliance.org/ > < Caution-Caution-http://www.ecohealthalliance.org/ < caution-Caution-http://www.ecohealthalliance.org/ > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

HDTRA1-14-24-FRCWMD-BAA
CBEP = Thrust Area 6 - Cooperative Counter WMD Research
with Global Partners FRCWMD

"Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity"

Abstract: In line with Thrust Area 6 - Cooperative Counter WMD Research with Global Partners FRCWMD, we propose a multi-disciplinary One Health research project to identify causal factors in the transmission of Middle East Respiratory Syndrome Coronavirus (MERS), avian influenza (AI), and other zoonoses from animals to humans in Jordan, while simultaneously strengthening local capacity for prevention, detection, and reporting of these zoonoses in Jordan, Iraq, and Lebanon. Little is known about the transmission routes of MERS, AI, and other key zoonoses at human-livestock/poultry interfaces in Jordan. To fill this gap and contribute to biological threat reduction, we propose a hypothesis-driven One Health research project to characterize exposure risks for MERS and AI in Jordan using epidemiological causal inference techniques and improving serological technology. This prospective cohort study involves interviews and longitudinal sampling of humans and opportunistic non-lethal sampling of livestock and poultry at animal markets, farms, and abattoirs for MERS, *Brucella* spp., and *Leptospira* spp. (humans/livestock) and for AI subtypes (humans/poultry). Partner laboratories in Jordan will screen and characterize these zoonotic pathogens, and capacity-building cross-trainings will be conducted with visiting laboratory scientists from Iraq and Lebanon. This multifaceted One Health approach will advance scientific knowledge on the risk of MERS, AI, and other zoonoses in Jordan, strengthen local zoonotic disease surveillance capabilities, and enhance scientific partnerships in Jordan, Iraq and Lebanon to prevent, detect, and report MERS, AI, and other zoonotic threats.

Background: There have been over 2,200 cases and 790 deaths across 27 countries from MERS since 2012. Although most cases occurred in the Kingdom of Saudi Arabia (KSA), the first known human infections occurred in Jordan. Most KSA cases have been healthcare-associated, stemming from secondary generations of transmission. Identification of factors involved in *primary* transmission may inform interventions to prevent future primary cases and therefore prevent them from seeding healthcare or community outbreaks. Camels are the presumptive source of primary human MERS infections; however, the exact mechanisms of transmission and the possible role of other livestock species are unclear. These uncertainties highlight the need to better understand the causal factors of primary human infection with MERS at human-livestock interfaces. **Understanding modifiable risk factors may lead to development of public health interventions that can prevent animal-to-human transmission of zoonoses.**

Avian influenza viruses circulate worldwide among migratory bird populations and occasionally spill into poultry at mass production sites, farms, or backyard coops. Although not every AI subtype is capable of infecting humans or causing severe illness, there have been worrisome outbreaks. AI A/H5N1 has been detected in humans in 16 countries since 2003, resulting in 860 cases and 454 deaths by July 2018. Of these, nearly 42% were in neighboring Egypt. Due to antigenic shifts typical of the influenza viral genome, there is always a possibility of new AI subtypes emerging capable of infecting humans. **In Jordan, the rapidly expanding poultry industry driven by ever-increasing demand poses a distinct global health security risk.**

Identification and characterization of AI subtypes circulating among poultry across Jordan will provide critical information needed to understand baseline activity and risks. If human AI infections are detected, the project could identify causal factors in poultry-to-human influenza transmission, and therefore inform interventions to prevent future primary cases. **Given the human AI infections in neighboring countries, this is a critical gap to be filled in Jordan.**

Other zoonoses, such as *Brucella* spp. and *Leptospira* spp., also cause morbidity in Jordan, and surveillance for them can be easily integrated into the research study as secondary outcomes. All samples may be made available to other DTRA- or USG-funded researchers.

Scientific Impact for C-WMD Science: Given that transmission of high-consequence zoonotic pathogens such as MERS and AI, whether by nature or ill intent, poses a significant threat to global security, existing gaps in biosurveillance/detection capabilities, prevention/response activities, and reporting weakens our ability to counter biological WMD threats. Over 60% of emerging infectious diseases originate in animals, so it is imperative to strengthen local capacity to conduct biosurveillance for zoonotic disease threats to understand existing baselines of transmission, characterize risk factors to inform prevention activities that can interrupt transmission, and preempt and/or rapidly respond to emerging disease threats.

Our primary objectives are to characterize causal factors in animal-to-human transmission of MERS, AI, and other zoonoses in Jordan and to strengthen regional capacity for detection of these pathogens in order to reduce the threat of infectious diseases. Our proposed project will rigorously test the following initial hypotheses:

H_1. Livestock species and poultry in Jordan show evidence of infection with MERS, AI, and/or other assayed zoonoses. (*Output: Geospatial maps of naturally-occurring zoonotic viruses and bacteria capable of infecting humans developed with and shared with government authorities*)

H_2. Humans occupationally exposed to livestock and/or poultry have a greater risk of infection with MERS, AI, and/or other assayed zoonoses compared to other community members in Jordan. (*Output: Geospatial risk maps developed with and shared with government authorities*)

H_3. Some specific occupational practices that promote exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) pose a greater risk of infection with MERS, AI, and other assayed zoonoses compared to others. (*Output: Enhanced understanding of modifiable risk factors to inform government authorities on prevention activities*)

Knowledge generated from this project will confirm the presence of MERS, AI, and other zoonoses at human-livestock/poultry interfaces in Jordan, characterize specific occupational practices as causal factors in human infection with these zoonoses, and identify modifiable risk factors that may be used to inform prevention activities. The project will build and boost local capacity for prevention, detection, and reporting of zoonotic disease threats in Jordan, Iraq and Lebanon through regional cross-training workshops held in Jordan, all of which have substantial camel and poultry production (**Fig. 1**). This will fill capacity gaps, strengthen collaborative relationships, and foster goodwill in a politically fragile region, enhancing our ability to combat biological threats.

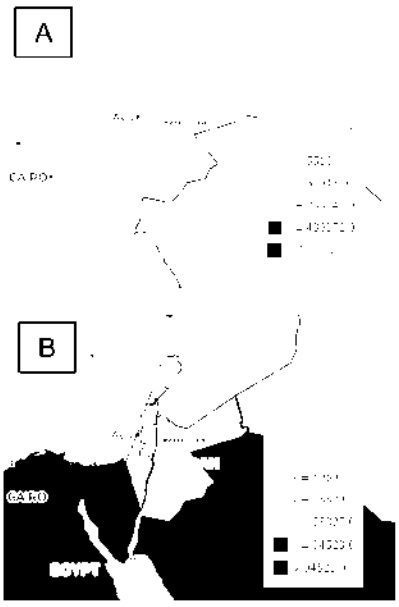

Figure 1: Regional map of live camel (A) and poultry (B) production, 2015.

Methodology: We propose to conduct a prospective cohort study with repeated surveys at various human-livestock/poultry interfaces across Northern, Middle, and Southern Jordan. Each interface will be visited thrice a year for 3 years (9 total visits per site) or 4 and 12 respectively if option years are exercised.

During each human-livestock interface visit, livestock (e.g., camels, goats, sheep, cattle) will be opportunistically tested for evidence of active infection with MERS using nasal swabs. During the first, fifth, and final visits, livestock will be opportunistically tested for past infection with MERS, *Brucella* spp., and *Leptospira* spp. using sera. Swab samples will be pooled by species + site + visit date and tested via real-time PCR. Serum samples will be tested via Luminex. During each human-poultry interface visit, poultry will be sampled for AI using oropharyngeal swabs. During the first, fifth, and final visits, poultry will be opportunistically tested for past infection with AI using sera.

Individuals at each site and its surrounding community will be approached for enrollment at the first visit. Those providing informed consent will complete a standardized questionnaire (the previously Jordan-approved and tested PREDICT-2 questionnaire augmented with study-specific items) during the first visit and complete a shorter questionnaire at each subsequent visit to account for time-varying factors. Participants will provide oropharyngeal and nasopharyngeal swabs at each visit and sera at the first, fifth, and final visits. These samples will be tested using PCR for the swab samples (MERS and AI) and Luminex serology for the serum samples (all 4 zoonoses).

Data will be analyzed to generate geospatial maps of livestock and poultry zoonoses, geospatial maps of human zoonotic disease risk (including static and seasonal versions), exposure risk models using causal inference techniques, and prediction models for transmission that can account for seasonal variations and wide-scale livestock/poultry practice trends.
Implementation of Luminex Serological Technology: Luminex technology for serology and associated equipment will be acquired for participating laboratories in Jordan. Training workshops will be held in Jordan for regional scientists, with refresher trainings held annually.

Regional Capacity Building: Iraqi and Lebanese scientists from their Ministries of Health and Agriculture will be invited to participate in capacity-building workshops in Jordan. Workshops will cover topics including implementing/using Luminex technology, animal and human sampling fieldwork, ethical human subjects research, biosafety and biosecurity best practices, data management and storage, and reporting procedures pursuant to OIE, WHO, IHR, and GHSA obligations. Advance technical training for key individuals is proposed for option years.

Our research project will serve multiple goals and objectives of the CBEP mission, by: 1) engaging partner country scientists in hypothesis-driven research; 2) supporting biosurveillance capacity building by enhancing partner capability to detect and report select agents; 3) enhancing

understanding of zoonotic diseases to allow differentiation of natural versus nefarious emergence events; 4) employing responsible bio-risk management best practices; 5) training partner country researchers to think critically about ethical research and be competitive in soliciting international funding; and 6) promoting a One Health concept.

Core Team and Project Organization:

- EcoHealth Alliance (EHA, prime), led by Dr. William Karesh (PI) and Dr. Patrick Dawson (co-PI), will design, implement, and oversee the research project; lead all contractual obligations with DTRA and project sub-awardees; coordinate travel and organize workshops; manage the information database; ensure coordination between partners; and collaborate with our partners in analyzing the data and publishing it.
- Jordan University of Science and Technology (JUST), led by Dr. Ehab Abu-Basha (co-PI), will conduct fieldwork and laboratory work on the research study. EHA has worked extensively with JUST and Dr. Abu-Basha on the USAID PREDICT-2 project, conducting viral surveillance among humans and animals and risk characterization since 2016.
- Partner Laboratories: JUST (Irbid, Jordan) and Jordan Ministry of Agriculture (Amman, Jordan). These institutions have demonstrated capacities for all required laboratory work, training workshops, and specimen storage. Additional laboratory partners may be added following consultation with national partners and DTRA.

Potential Challenges, Solutions, and Statistical Considerations: The main potential challenge will be a low detection rate of MERS, AI, and other zoonoses among human participants. However, power calculations to determine an appropriate sample size will be informed using recent, credible findings from the PREDICT-2 project. Another potential challenge is addressing cultural sensitivities while conducting work, such as avoiding stigmatization of livestock workers or working with various Bedouin communities. EHA and JUST have extensive experience in this domain through PREDICT-2, and have fostered positive relationships with community leaders and liaisons throughout Jordan. To reduce regional instability risk, we will be work in Jordan, a stable bedrock in the region, and will invite regional scientists to workshops inside Jordan rather than traveling to them.

Major Goals and Milestones: 1) Determine the presence of MERS, AI, and other zoonoses among livestock and/or poultry in Jordan. 2) Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. 3) Characterize causal factors in animal-to-human transmission of these zoonoses. 4) Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. 5) Identify specific modifiable risk factors for human infection with these zoonoses. 6) Implement Luminex serological technology in Jordan for enhanced diagnostic and detection capabilities. 7) Strengthen local capacity for detection and reporting of MERS, AI, and other zoonoses in Jordan, Iraq, and Lebanon through workshops.

Proposed Budget (in US$)

Organization	Year 1	Year 2	Year 3	OY1	OY2
EcoHealth Alliance (Prime)	$492,000	$495,000	$498,000	$490,000	$445,000
JUST	$487,000	$493,000	$498,000	$500,000	$430,000
TOTALS	**$979,000**	**$988,000**	**$996,000**	**$990,000**	**$875,000**

Cover Sheet

Proposal Number	FRBAA14-6-2-0442
Phase I Proposal Number	FRBAA14-6-1-0958
Topic	Thrust Area 6
Proposal Title	Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity

Applicant Information

Applicant	EcoHealth Alliance	**Mail Address**	460 W 34 St 17th Floor
Tax ID	311726494	**City**	New York
DUNS	0770900660000	**State/Province**	NY
CAGE		**Zip**	10001 - 2320
Website		**Country**	USA
POC Name	Dr. William Karesh	**POC Email**	karesh@ecohealthalliance.org

Cost

Applicant Certification

Organization Type	Non-Profit Organization
Are Human Subjects involved?	**No**
Are Vertebrate Animals involved?	**No**
Has a proposal for essentially equivalent work been submitted to other US government agencies or DoD components?	**No**

Agency 1	**Contract/Grant No.**
Agency 2	**Contract/Grant No.**
Agency 3	**Contract/Grant No.**

Are you a current DoD Contractor or Grantee?	**No**
Agency	**Point Of Contact**
Phone #	

Principal Investigator 1		Business Official 1	
Prefix	Dr.	**Prefix**	Dr.
Name	William Karesh	**Name**	Aleksei Chmura
Title	Executive Vice President of Health and Policy	**Title**	Authorized Organizational Representative
Address 1	460 W 34 St	**Address 1**	460 W 34 St
Address 2	17th Floor	**Address 2**	17th Floor
City	New York	**City**	New York
State	NY	**State**	NY
Country	USA	**Country**	USA
Zip	10001 - 2320	**Zip**	10001 - 2320
Phone	212-380-4463 Ext :	**Phone**	212-380-4473 Ext :
Fax		**Fax**	
Email	karesh@ecohealthalliance.org	**Email**	chmura@ecohealthalliance.org

For any purpose other than to evaluate the white paper/proposal, this data shall not be disclosed outside the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if an award is made to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the agreement. This restriction does not limit the right of the Government to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained on the pages listed below.

Proprietary Information (list page numbers)

List a maximum of 8 Key Words or phrases, separated by commas, that describe the Project.

Technical Abstract (Limit your abstract to 200 words with no classified or proprietary information)

This publicly releasable abstract is provided to DTRA for use in fulfillment of Section 8123 of the Defense Appropriations act and future versions of the same. Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity In line with Thrust Area 6 - Cooperative Counter WMD Research with Global Partners FRCWMD, we propose the first multi-disciplinary One Health research project to identify factors which allow or facilitate the transmission of Middle East Respiratory Syndrome Coronavirus (MERS-CoV), avian influenza (AI), and other infectious agents which spread from animals to humans in Jordan, while simultaneously strengthening local capabilities for prevention, detection, and reporting of these diseases in Jordan, Iraq, and Lebanon. Little is known about the transmission routes of MERS-CoV, AI, and other key diseases at humanlivestock/poultry interfaces in Jordan. To fill this gap and contribute to biological threat reduction, we have designed a hypothesis-driven One Health research project to characterize exposure risks for high consequence zoonotic diseases in Jordan using advanced epidemiological inference techniques and improve diagnostic testing using methods that do not require manipulation or

culturing of live viruses, further reducing the risk of accidental laboratory outbreaks and access to pathogens that could be used as biological weapons. This prospective cohort study involves interviews and longitudinal sampling of humans and opportunistic nonlethal sampling of livestock and poultry at animal markets, farms, and abattoirs for MERS-CoV, Brucella spp., and Leptospira spp. (humans/livestock) and for the full range of Influenza A found in humans and animals. Under close supervision, partner laboratories in Jordan and Egypt will screen for and characterize these pathogens. Capacity-building cross-trainings on diagnostics, epidemiology and risk reduction strategies will be conducted with visiting laboratory scientists and government authorities from Iraq and Lebanon. This multifaceted One Health approach will advance scientific knowledge on the risk of MERS-CoV, AI, and other zoonoses in Jordan, strengthen local zoonotic disease surveillance capabilities, and enhance scientific partnerships in Jordan, Iraq and Lebanon to prevent, detect, and report MERS-CoV, AI, and other zoonotic threats.

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity

Phase II Technical Proposal

I. ABSTRACT

In line with Thrust Area 6 - Cooperative Counter WMD Research with Global Partners FRCWMD, we propose a multi-disciplinary One Health research project to identify causal factors in the transmission of Middle East Respiratory Syndrome Coronavirus (MERS-CoV), avian influenza (AI), and other zoonoses from animals to humans in Jordan, while simultaneously strengthening local capacity for prevention, detection, and reporting of these zoonoses in Jordan, Iraq, and Lebanon. Little is known about the transmission routes of MERS-CoV, AI, and other key zoonoses at human-livestock/poultry interfaces in Jordan. To fill this gap and contribute to biological threat reduction, we propose a hypothesis-driven One Health research project to characterize exposure risks for high consequence zoonotic diseases in Jordan using epidemiological causal inference techniques and improving serological testing using methods that do not require manipulation or culturing of live viruses. This prospective cohort study involves interviews and longitudinal sampling of humans and opportunistic non-lethal sampling of livestock and poultry at animal markets, farms, and abattoirs for MERS-CoV, *Brucella* spp., and *Leptospira* spp. (humans/livestock) and for AI subtypes (humans/poultry). Partner laboratories in Jordan will screen and characterize these zoonotic pathogens, and capacity-building cross-trainings will be conducted with visiting laboratory scientists from Iraq and Lebanon. This multifaceted One Health approach will advance scientific knowledge on the risk of MERS-CoV, AI, and other zoonoses in Jordan, strengthen local zoonotic disease surveillance capabilities, and enhance scientific partnerships in Jordan, Iraq and Lebanon to prevent, detect, and report MERS-CoV, AI, and other zoonotic threats.

II. SCOPE

A. Objective

Our primary research objectives are to characterize causal factors in animal-to-human transmission of MERS-CoV, AI, and other zoonoses in Jordan and to strengthen regional capacity for detection of these pathogens in order to reduce the threat of infectious diseases. Our proposed project will rigorously test the following initial hypotheses:

- **H_1.** Livestock species and poultry in Jordan show evidence of infection with MERS-CoV, AI, and/or other assayed zoonoses.
- **H_2.** Humans regularly exposed to livestock and/or poultry or their living areas have a greater risk of infection with MERS-CoV, AI, and/or other assayed zoonoses compared to other community members in Jordan.
- **H_3.** Some specific occupational practices that promote exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) pose a greater risk of infection with MERS-CoV, AI, and other assayed zoonoses compared to others.

Together, this research will generate critical advances in detecting the presence of and exposure risk to high-consequence zoonotic viruses and bacteria across geographic regions and interfaces, contributing to enhanced understanding of modifiable risk factors to inform government authorities on prevention activities to reduce disease threats.

B. Background

Jordan is an upper middle-income country with a total population of 9.7 million. Jordan has experienced several important zoonotic diseases in the few past years including Influenza A

(H1N1) pdm09 and MERS-CoV. Furthermore, an outbreak of H5N1 was reported in Jordan in 2006. A pandemic influenza surveillance plan that includes Severe Acute Respiratory Infection and other influenza-like illnesses has been in written[1] but needs capacity building to implement.

High-consequence zoonotic pathogens in the Middle East have resulted in disease epidemics of international importance, raising the need for health security enhancements to strengthen the region's ability to prevent, detect and respond to multiple zoonotic disease threats. In Jordan, MERS-CoV, AI and brucellosis are major public health concerns, with limited multisectoral preparedness capacity.[2] MERS-CoV is recognized as a threat to global health security, with designation as a priority disease under the World Health Organization (WHO) Research and Development Blueprint.[3] Since its initial emergence in 2012, there have been over 2,400 cases and 830 deaths across 27 countries from MERS. Although most cases have been reported in the Kingdom of Saudi Arabia (KSA), the first known human infections occurred in Jordan.[4,5] Most cases in KSA have been healthcare-associated, stemming from secondary generations of transmission.[6,7] Identification of factors involved in *primary* transmission may inform interventions to prevent future primary cases and therefore prevent them from seeding healthcare or community outbreaks. Camels are the presumptive source of primary human MERS-CoV infections; however, the exact mechanisms of transmission and the possible role of other livestock species are unclear.[8] These uncertainties highlight the need to better understand the causal factors of primary human infection with MERS-CoV at human-livestock interfaces given the high livestock-human contact in camel production systems in Jordan.[9] **Understanding modifiable risk factors may lead to development of public health interventions that can prevent animal-to-human transmission of zoonoses.**

Avian influenza viruses circulate worldwide among migratory bird populations and occasionally spill into poultry at mass production sites, farms, or backyard coops. Although not every AI subtype is capable of infecting humans or causing severe illness, highly pathogenic strains present risk to both animal and humans and are associated with major socio-economic losses. **In Jordan, the rapidly expanding poultry industry driven by ever-increasing demand poses a distinct global health security risk.** Identification and characterization of AI subtypes circulating among poultry across Jordan will provide critical information needed to understand baseline activity and risks. If human AI infections are detected, the project could identify causal factors in poultry-to-human influenza transmission, and therefore inform interventions to prevent future primary cases. **Given the human AI infections in neighboring countries, this is a critical gap to be filled in Jordan.**

To understand and reduce the threat of major zoonotic diseases in Jordan, we propose a One Health study in animals and humans to characterize exposure risks for priority pathogens that may potentially be associated with specific interfaces, behavioral practices, and environmental determinants (i.e., seasonality). To maximize potential for sustainability of zoonotic disease capacity in the country, the project is built around an all-hazards approach to detect pathogens and identify risk factors. Therefore, in addition to MERS-CoV and AI, *Brucella* spp. and *Leptospira* spp., which also cause morbidity in Jordan, will be integrated into the research study as secondary outcomes. Preliminary studies indicate associations between poor biosecurity and elevated seroprevalence of these bacterial diseases in animals in Jordan, as well as poor disease management practices when disease is suspected.[10-12] Therefore, this study will build on exiting capacity and provide an entry point for integrated prevention and control strategies for priority emerging and endemic zoonoses in the country and region.

Scientific Impact for C-WMD Science: Given that transmission of high-consequence zoonotic pathogens such as MERS-CoV and AI, whether by nature or ill intent, poses a significant threat to global security, existing gaps in biosurveillance/detection capabilities, prevention/response activities, and reporting weakens our ability to counter biological WMD threats. Over 60% of emerging infectious diseases originate in animals, so it is imperative to strengthen local capacity to conduct biosurveillance for zoonotic disease threats to understand existing baselines of transmission, characterize risk factors to inform prevention activities that can interrupt transmission, and preempt and/or rapidly respond to emerging disease threats. As a key area of stability in the region, enhancing Jordan's capacity for threat reduction for these diseases that pose serious potential human health, economic, and food production and security consequences is critical to protect U.S. warfighters as well as our regional allies (e.g. Jordan, Israel). Based on our analysis of risk drivers, the study regions are identified as elevated risk for disease emergence; ground-truthing is imperative to detect circulation trends and mitigate threats.[13] **Knowledge generated from this project will confirm the presence of MERS-CoV, AI, and other zoonoses at human-livestock/poultry interfaces in Jordan, characterize specific occupational practices as causal factors in human infection with these zoonoses, and identify modifiable risk factors that may be used to inform prevention activities.**

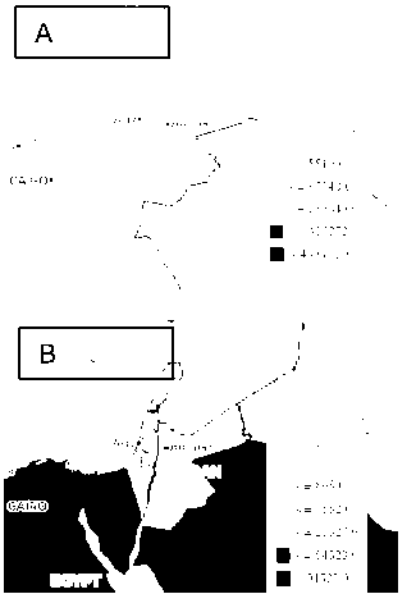

Figure 1. Regional map of live camel (A) and poultry (B) production, 2015

Through regional cross-training workshops held in Jordan, the project will also build upon and boost local capacity for prevention, detection, and reporting of zoonotic disease threats in Jordan, Iraq and Lebanon, all of which have substantial camel and poultry production (**Figure 1**). This will fill capacity gaps, strengthen collaborative relationships, and foster goodwill in a politically fragile region, enhancing our ability to combat biological threats.

Data will be analyzed to generate geospatial maps of livestock and poultry zoonoses, geospatial maps of human zoonotic disease risk (including static and temporal versions), exposure risk models using causal inference techniques, and prediction models for transmission that can account for seasonal variations and wide-scale livestock/poultry practice trends.

Regional Capacity Building: Iraqi and Lebanese scientists from their Ministries of Health and Agriculture will be invited to participate in capacity-building workshops in Jordan. Workshops will cover topics including implementing/using technology, animal and human sampling fieldwork, ethical human subjects research, biosafety and biosecurity best practices, data management and storage, and reporting procedures pursuant to OIE and WHO obligations. Advanced training for key individuals from Iraq and Lebanon is proposed for Year 3 and Option Years.

Our research project will serve multiple goals and objectives of the BTRP mission, by: 1) engaging partner country scientists in hypothesis-driven research; 2) supporting biosurveillance capacity building by enhancing partner capability to detect and report select agents; 3) enhancing understanding of zoonotic diseases to allow differentiation of natural versus nefarious emergence events; 4) employing responsible bio-risk management best practices; 5) training partner country

researchers to think critically about ethical research and be competitive in soliciting international funding; and 6) promoting the One Health concept.

Major Goals and Milestones (details in Section VI): 1) Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan: *Implement animal study; Conduct PCR and serology testing.* **2)** Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses: *Implement human cohort study; Conduct PCR and serology testing.* **3)** Characterize causal factors in animal-to-human transmission of these zoonoses: *Implement behavioral risk survey; Conduct epidemiological analyses.* **4)** Produce geospatial maps of zoonoses in livestock/poultry and human zoonotic transmission risk: *Generate geospatial distribution and risk maps.* **5)** Strengthen capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon: *Host workshops; Submit reports and publications; Attend presentations/meetings.* **6)** Identify specific modifiable risk factors for human infection with these zoonoses: *conduct causal interference analyses; provide policy recommendations.*

Methodology

Ethical Considerations: The study team will obtain required ethical approvals for both humans and animals prior to study initiation. For human subjects research, the informed consent documents (English and Arabic), study protocol (English), and questionnaires (English and Arabic) will be submitted to the Jordan University of Science and Technology (**JUST**) Institutional Review Board (IRB) in Irbid, Jordan and HummingbirdIRB in Needham, Massachusetts, USA (via EcoHealth Alliance (**EHA**)). For animal subjects research, the study protocol (English) will be submitted to the JUST Institutional Animal Care and Use Committee (IACUC) and a U.S. institution. All study team members will be trained on Collaborative Institutional Training Initiative (CITI) human subjects research (social/behavioral and biomedical), ethical research with animals ("Working with the IACUC"), and the USAID funded PREDICT-2 project training modules (basic laboratory safety, biosafety and biosecurity, safe animal sampling, cold chain implementation, and various other preparatory trainings). To maintain privacy, results will be presented in aggregate; no individual data will be shared.

Study Design: The proposed study is a prospective cohort study to evaluate behavioral and occupational risk factors for zoonotic infectious diseases (MERS-CoV, avian influenza, brucellosis, and leptospirosis) among persons living in Jordan in any of the five study regions. The exposure of interest is regularly (once a month or more) working with any livestock animal or poultry or sharing their living areas with these animals. Key sub-exposures will be evaluated to determine whether specific behavioral or occupational interactions with specific animal taxa or their living areas increase the risk of acquiring one of the four zoonotic infections being studied. The key sub-exposures, such as "milking camels" or "cleaning poultry cages," which may be identified as risk factors in this study, will be identified as modifiable risk factors behaviors or interactions that can be targeted during future disease prevention activities (e.g., using gloves, wearing a face mask, vaccinations, hand washing, pasteurization, etc.).

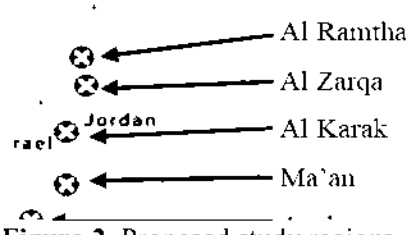

Figure 2. Proposed study regions.

Study Sites: Sites will be selected in five geographically-representative regions across Jordan (**Figure 2**): Northern Jordan (Al Ramtha), Middle Jordan (Al Zarqa), and Southern Jordan (Al Karak, Ma'an, and Aqaba). These regions were selected based on preliminary findings by our team and the presence of livestock production activities where we theorize pathogen transmission is likely to occur. Al Ramtha and Al

Zarqa were included as part of the PREDICT-2 study on MERS-CoV in people, camels, and bats. Two individuals having a confirmed MERS-CoV seropositive test result were previously identified in Al Ramtha by our PREDICT-2 project. Al Zarqa is the location of the first ever known human cases of MERS-CoV reported to the WHO. In 2016, the Food and Agriculture Organization of the United Nations (FAO) detected MERS-CoV virus-positive camels in both Al Ramtha and Al Zarqa. Little is known about the current circulation of MERS-CoV among human or camel populations in Southern Jordan, but Southern Jordan has a greater density of camel livestock than Northern and Middle Jordan. There are numerous poultry farms in all five study regions; while avian influenza in poultry has been detected previously in Jordan, regional or national estimates of avian influenza incidence or prevalence are lacking and this study will therefore better elucidate distribution trends.

Within each of the five study regions, sampling sites will be selected to ensure interfaces with poultry, camels, and other livestock animals are represented (e.g. farms or markets). Each region will include one or more of the following three types of sampling sites: poultry farm or production interface, camel farm or production interface, and "other" livestock farm or production interface where a least one other non-poultry/non-camel livestock animal is present, such as cattle or sheep. Sites with two or more of the interface types present may be included.

Potential sampling sites within each of the five regions will be identified and assessed prior to the beginning of the study and will be categorized by interface type (i.e., poultry, camels, "other," or a combination of multiple interface types) and expected number of persons in and around the site (<20, 21-50, 51-100, or 101+ persons). In each region, the study team will randomly select one site at a time until each of the three animal interface types are evenly represented, then continue to select additional sites until the combined expected number of persons in and around the selected sites exceeds 600 so the region enrollment goal (60) will remain less than 10% of the available population in the region. If it is not possible to reach this number, then all identified sites will be visited for that region. Selected sites will be visited in a random order during each region's first enrollment visit until all three interface types have been visited at least once and the site enrollment goal has been reached.

Study Population: The study will enroll persons regularly working with livestock or poultry or sharing their living areas with these animals as well as persons unexposed to these factors. Based on site selection, people living or working in the five regions will be eligible for recruitment in the study. Inclusion criteria are adults (18 years or older) providing informed consent and children (12 years or older) providing verbal assent and having a parent or guardian able to provide informed consent. Informed consent or assent may be withdrawn by the participant or their parent or guardian at any time during the study procedures or at any future study visit. Exclusion criteria are children less than 12 years old, adults unwilling or unable to provide informed consent, children aged 12-17 years old unwilling or unable to provide assent, and children aged 12-17 years old without a parent or guardian willing or able to provide informed consent. Those approached for recruitment who provide informed consent (and assent if a child) and complete a brief pre-screening questionnaire will be enrolled if they are selected based on their exposure status and the study recruitment quota for the exposed or the unexposed.

Sample Size Calculations: Using an acceptable Type I error rate of 5% and power of 80%, the minimum sample size was computed to detect a difference where 1% (1 out of 100) of unexposed persons (those who do not regularly work with livestock animals or poultry or share their living areas) will have at least one positive test result for at least one of the four zoonotic infections during the study and 12.5% (1 out of 8) of exposed persons (those who regularly work

with livestock animals or poultry or share their living areas) will have at least one positive test result for at least one of the four zoonotic infections during the study. Given these parameters while using the Fleiss method with a continuity correction applied, the minimum sample size needed for the study is 73 unexposed and 145 exposed individuals.

It is estimated that up to 20% of study participants may be lost to follow-up over the course of the study. To maintain the minimum sample size needed to detect the statistical associations of interest, a correction factor of 1.25 (division of 80%) was applied to the minimum sample size. This results in 91 unexposed and 181 exposed individuals needed at the beginning of the study. To account for the marginal possibility that some participants already have evidence of infection with at least one of the four zoonotic infections at the beginning of the study (and therefore must be excluded from the prospective cohort study), these enrollment goals will be rounded up to 100 unexposed and 200 exposed persons, for a total of 300 participants. This results in enrollment goals of 20 unexposed and 40 exposed persons in each of the five regions.

Study Procedures: All written and verbal interactions with potential study participants will be conducted in Arabic by native Arabic-speaking study team members. Individuals present at each study site will be approached for possible recruitment into the study through systematic random sampling until the site's exposed and unexposed enrollment goals are met. A culturally- and financially-appropriate token of appreciation (as deemed by local Jordanian stakeholders and community leaders) will be offered to enrolled participants at each study site visit to encourage retention in the study but not to unduly influence a participant's willingness to participate. Participants providing informed consent first will be asked to complete a pre-screening checklist to determine their enrollment into the study. This checklist will rapidly assess whether the participant would be categorized as "exposed" or "unexposed" in the study based on their interactions with livestock and poultry or their living areas. Participants will be enrolled at each site until the maximum enrollment for the exposure category for the site has been reached.

Enrolled participants will be asked to have two nasopharyngeal and oropharyngeal (NP/OP) swabs taken and serum collected by a trained nurse. Participants will be assigned a unique identifier to track their future participation over the course of the study. They will also be asked to provide contact information so they may be reached during future study visits. Study site visits will be made every three months for a total of 13 study visits per site. Although it is expected that not all participants will be available at every study site visit, every effort will be made to provide ample opportunities for continued participation.

Upon initial enrollment, participants will be verbally administered a standardized questionnaire by a trained member of the field team based on the PREDICT-2 Human Behavioral Risk Questionnaire (example provided in Attachment 3) augmented with animal-specific exposure frequency questions to collect demographic data, symptom and medical history data, social history data, and specific animal-related behaviors and practices that are possible risk factors for infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. During all future visits, enrolled participants will be administered a brief follow-up questionnaire designed primarily to capture time-varying exposure and covariate data. Participants will be asked to have NP/OP swabs taken at all visits. Serum will be collected on the 1st, 7th, and 13th visit.
Beginning with the first visit, the study team will also conduct opportunistic sampling of livestock taxa and poultry at each site as described in the following section. To detect potential pathogen shedding, animal and human sampling will occur within the same week (ideally the same days) at each site. Since animals are not the subject of the cohort study design (and instead will be sampled to provide covariate data for statistical modeling), there is no minimum sample

size required at a given site or sampling visit. The livestock or poultry present at each site may differ from sampling visit to sampling visit, and therefore individual animals will not be sampled longitudinally. Animal sampling parameters are provided below.

Sampling Schedule and Laboratory Assays: Sampling will begin during the third quarter of Year 1. Each site will be visited every 3 months until the final visit during the third quarter of Option Year 1 for a total of 13 sampling visits (**Table 1**). Sites will be visited sequentially during each sampling period, with several days allotted for sampling at each site.

Table 1. Sampling schedule for proposed study.

Year 1	Q1		**Year 2**	Q1	S_3	**Year 3**	Q1	S_7	**OY1**	Q1	S_{11}
	Q2			Q2	S_4		Q2	S_8		Q2	S_{12}
	Q3	S_1		Q3	S_5		Q3	S_9		Q3	S_{13}
	Q4	S_2		Q4	S_6		Q4	S_{10}		Q4	-

*OY=Option Year; Q=Quarter; S_n=Sampling visit number

Human Sampling: Individuals enrolled in the study will be asked to have two NP/OP swabs taken at each visit (**Table 2**). Each participant's swabs will be tested for MERS-CoV and influenza via RT-PCR after each sampling visit. At the 1st, 7th, and 13th (or final) sampling visit, serum will be collected for serology testing for MERS-CoV, AI, brucellosis, and leptospirosis antibodies (**Table 2**).

Table 2. Specimen type, assay, and sampling frequency for humans.

Specimen Type	**Assay**	**Infection**	**Frequency**
NP/OP swabs (2x each)	RT-PCR	MERS-CoV	Each visit (3 mos.)
		Influenza	Each visit (3 mos.)
Serum	Serology	MERS-CoV	1st, 7th, and 13th visit
		Influenza	1st, 7th, and 13th visit
		Brucellosis	1st, 7th, and 13th visit
		Leptospirosis	1st, 7th, and 13th visit

*NP/OP=Nasopharyngeal and oropharyngeal

Livestock and Poultry Sampling: During each site visit, livestock and poultry will be opportunistically sampled to assess infectious activity among animals present as well as to provide covariate data for the human study (i.e., "MERS-CoV-positive camels present at site"). Nasal swabs will be collected from up to 20 livestock animals per animal taxa at each site per visit, and oropharyngeal (OP) swabs will be collected from up to 20 poultry at each site per visit. Sampled animals will be temporarily marked with an adhesive colored band to avoid redundant sampling during the duration of the study site visit, which may last several days. Animal sampling schedule is provided in **Table 3**.

Laboratory testing: Nasal swabs will be tested for MERS-CoV by RT-PCR at the Molecular Biology and Virology lab in the Faculty of Veterinary Medicine/Jordan University of Science and Technology (MBVL/JUST) to detect whether at least one MERS-CoV-positive livestock animal was present at the site when humans were being sampled. MERS-CoV real time PCR are based on targeting upE and ORF 1a as proposed by Corman, 2012.[14] OP swabs will be tested for Influenza A by RT-PCR at the MBVL/JUST to detect whether at least one influenza-positive bird was present at the site when humans were being sampled. Real Time PCR assay will be classified into general real time PCR targeting the matrix gene for identification of influenza A, and then specific real time PCR assays for identification of influenza A subtypes H5,H7 and H9. The general real time PCR for influenza A will be done according to Spackman and Suarez, 2008,[15] and for H5,H7 and H9 the protocol will be based on Monne et al, 2008.[16]

On the 1st, 7th, and 13th (final) sampling visit blood for serum testing will be collected from humans, livestock and poultry to be tested for MERS-CoV, influenza, brucellosis, and leptospirosis antibodies using serology (**Table 3**). Human serum will be tested for MERS-CoV antibodies by Co-I Kayali (**Human Link**) at the Human Link lab at the National Research Centre in Egypt using a pseudoparticle neutralization (ppNT) assay where the spike protein of MERS-CoV is expressed by a replication-incompetent human immunodeficiency virus (HIV) thus avoiding the use of live MERS-CoV in the assay as described by Co-I Kayali.[17] Sera will be screened at a dilution of 1:10 and positive sera will be tested for end-point titers.

Animal serum will be tested for MERS-CoV antibodies at the Diagnostic Laboratory-Faculty of Veterinary Medicine/JUST using a S1-based ELISA kit from EUROIMMUN.[18] Human and animal serology for avian influenza will be performed at MBVL/JUST using Hemagglutination inhibition and serology according to the published protocol by Kayali et al, 2008.[19] Human and animal serology for brucellosis will be conducted at the Diagnostic Laboratory/JUST using the rose Bengal test for screening and a brucellosis complement fixation test (from Jordan Bio Industries Center (JOVAC), Amman, Jordan) for confirmation. Human and animal serology for Leptospirosis will be conducted at the Diagnostic Laboratory/JUST using a commercially available ELISA test. **All samples will be made available to other DTRA- or USG-funded researchers. All collected materials will be will be transported from field to labs on wet or dry ice by project personnel and stored in approved facilities indicated in the PRAT forms and destroyed at the conclusion of the study.**

Positive tests results for reportable diseases will be provided to relevant Jordanian authorities immediately for action as done by our group under USAID PREDICT-2.

Table 3. Specimen type, assay, and sampling frequency for livestock and poultry.

Specimen Type	Assay	Infection	Frequency
Nasal swabs (by taxa + site) - livestock	RT-PCR	MERS-CoV	Each visit (3 mos.)
Oropharyngeal swabs (by site) - poultry	RT-PCR	Influenza	Each visit (3 mos.)
Serum livestock	Serology	MERS-CoV	1st, 7th, and 13th visit
		Brucellosis	1st, 7th, and 13th visit
		Leptospirosis	1st, 7th, and 13th visit
Serum – poultry	Serology	Influenza	1st, 7th, and 13th visit

Analysis Plans

Geospatial Risk Mapping: Following completion of each quarter's sampling visits and testing, geospatial maps of human and animal infections with MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated. These will be shared with USG/ DTRA and Jordanian Ministry partners quarterly. Once human behavioral risk data become available, preliminary statistical models will be constructed to generate geospatial risk maps directly linking human-animal interactions with risk of human infection with the four zoonoses.

Temporal Assessment: At the completion of the third year's sampling visits, human and animal zoonotic infections with MERS-CoV, avian influenza, brucellosis, and leptospirosis will be assessed for potential temporal effects in Jordan. This will be updated should the option years be exercised. This will provide critical information on expected background activity of each zoonosis geographically by time of year, which will be essential in determining whether future zoonotic infection activity is exceeding baseline activity due to either a life course (e.g. birthing) or seasonal factor or other unintended outbreak or nefarious activity.

Epidemiologic Causal Inference to Identify Modifiable Risk Factors: Specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine,

feces, and/or nasal secretions) will be assessed for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. These potential modifiable risk factors will be determined through epidemiologic analysis of the questionnaire data (including time-varying data) paired with individual laboratory results (e.g., detection of viral RNA, bacterial DNA, or antibodies). Causal inference techniques within the potential outcomes framework will be employed to solidify statistical associations as concretized biological/ clinical/environmental pathways by operationalizing exposures as well-defined interventions and ensuring exchangeability is maintained through confounder control informed by directed acyclic graphs of the conceptual exposure-disease pathways. While the study may detect associations specific to each of the four diseases, the intent of the study is designed to examine multiple zoonotic pathogens to inform general threat reduction guidelines and identify areas for future study. Identification of modifiable risk factors will inform intervention development that may interrupt future zoonotic transmission of the four pathogens in this study, which will be shared with USG/DTRA and the Jordanian Ministry partners at the annual stakeholders meeting in Year 3 and Option Year 2 as well as during in-person meetings with ministry officials and the threat reduction workshop as potential policy guidance for Jordanian authorities.

Training and Workshops: Training workshops will be held in Jordan throughout the project and will be open to scientists from the Ministries of Health and Agriculture from Jordan, Iraq, and Lebanon (**Table 4 and Attachment 3**) based on recommendations from existing partnerships. The workshops will be delivered by scientists from EHA and JUST. Project staff will be trained to collect biological samples, to promote animal welfare and ethics, and on human subjects research ethics, obtaining valid, informed consent and administering questionnaires (**Attachment 3**). Staff will be cross-trained so that members of the animal health team will be trained to give questionnaires and members of the human health team will be trained to record animal data to promote efficient collaboration in field activities and the One Health concept. We will invite additional stakeholders to select workshops via Jordan's One Health platform to encourage multisectoral buy-in, interpretation and understanding of study findings, and novel collaborations on solutions for threat reduction. We anticipate including 4 professional students per year (20 total) in field, laboratory and analytical components of the project. Three Jordanian scientists and three students will also be trained in laboratory techniques at the Human Link laboratory in Egypt during the course of the project.

Table 4. Proposed training and regional capacity-building workshops (see Attachment 3 for more details).

Date	Workshop Topic(s)	Audience
Year 1 Q2	• Basic Laboratory Safety, Biosafety and Biosecurity, Cold Chain Implementation, Ethical Human Subjects Research, Ethical Animal Subjects Research, Safe Human Sampling, Safe Animal Sampling, Questionnaire Administration, Data Management and Storage	Study team
Year 2 Q3	• All Topics Covered by First Workshop • Disease Reporting Procedures (OIE, WHO IHR)	Regional MOH/ MOA scientists
OY 1 Q3	• Influenza Subtyping, Genomic Analysis of MERS-CoV • Biosafety and Biosecurity Refresher Training	Study Team, Regional MOH/ MOA scientists
OY 2 Q3	• Workshop 1: Geospatial Analysis, Advanced Epidemiology, One Health Disease Surveillance; Workshop 2: Risk Reduction • Biosafety and Biosecurity Refresher Training	Regional MOH/ MOA scientists; OH Platform

III: PROGRAMMATICS

In the past three years, EHA and JUST have co-led implementation of the USAID Emerging Pandemic Threats PREDICT-2 project in Jordan, developing critical surveillance and laboratory capacity for MERS-CoV detection in the country. Through regional partnerships under PREDICT-2 the organizations also collaborated with Human Link on MERS-CoV and broader CoV and Influenza sampling and diagnostics in Jordan and Egypt. **Data collected from these studies in coordination with Ministries of Health and Agriculture represent some of the leading multi-year studies of viral circulation in wildlife in the region and generation of some the first evidence of camel-human transmission dynamics, which form the basis of the proposed study.** EHA also leads a bat CoV pathogen research network in Western and Central Asia (WAB-Net), with Co-Investigators from Jordan (RSS). The proposed study builds on these strong partnerships to generate complementary, fundamental research about risk factors for circulation of MERS and other important zoonotic diseases in people and livestock. Through their expertise and commitment to One Health approaches to support threat reduction, project partners also facilitated the establishment of the national One Health platform, which brings together focal points from Ministries of Agriculture, Environment and Health, WHO, FAO, OIE, JUST, and the Royal Scientific Society of Jordan, which the country has committed to supporting, demonstrating successful transition of ownership and giving us confidence in the high potential impact of the proposed project. This One Health Platform provides a foundation for our multisectoral project to disseminate results and develop practical, country-relevant policy recommendations and promote long-term capacity sustainment.

Table 5. Project partners and roles.

Institution	Study design	Human cohort recruitment	Human sampling, & training	Animal sampling, & training	Lab testing & training	Analysis & dissemination
EHA	✓(Lead)	✓ (Co-Lead)	✓	✓ (Co-Lead)		✓ (Lead)
Overall project oversight; weekly phone calls with partners; study design development and refinement field sampling; human subjects research & training; data analysis; and information dissemination through workshops, conferences, and papers; Tasks 1-6				*William B. Karesh*, DVM (PI); *Catherine Machalaba*, MPH, (CoI) Epidemiologist, Project Coordinator; *Emily Hagan*, MPH, Behavioral Risk Scientist; *Whitney Bagge, PhD, Data Analyst/Mapping/Modeling*		
JUST	✓	✓ (Lead)	✓ (Lead)	✓ (Lead)	✓ (Lead)	✓ (Co-Lead)
Overall project oversight for Jordan-based activities; study design; field and lab oversight and personnel decisions; Jordan staff management; laboratory training, staffing, & testing; liaison with MOH on human studies; liaison with MOA for animal studies; data analysis & dissemination; Tasks 1-6				*Ehab Abu-Basha*, MSc, DVM, PhD (Co-I) *Zaidoun Saleh Hijazeen*, MSVet Med, Infectious Diseases, Veterinarian *Moh'd Borhan Al-Zghoul*, MS, PhD, Immunologist, Molecular Biologist *Mustafa Ababneh*, BSVetMed, PhD, Laboratory Diagnostics, Virologist *Saad Gharaibeh*, BSVetMed, PhD, Avian Diseases, Virologist *Zuhair Bani Ismail*, BSVetMed, Clinical Med, Camels, Leptospirosis *Hani A. M. Talafha*, MS, Field Coordinator		
Human Link	✓		✓		✓ (Co-Lead)	✓

Conduct and oversee human testing for MERS-CoV; Training of Jordanian scientists, study design, data analysis & dissemination; Tasks 2,5				*Ghazi Kayali*, MPH, PhD, (CoI) Virologist, Epidemiologist		
US CDC	✓					✓
Project advisor on zoonotic diseases; data dissemination planning and implementation support; Tasks 1-6				*Patrick Dawson*, MPH, PhD, (CoI) Epidemiologist		
Jordan MoA	✓			✓	✓	✓
Project advisor on zoonotic diseases; data dissemination planning and implementation support; Tasks 1,3,5,6				Mahmoud Alhanatleh, BSVetMed, Chief Veterinary Officer, Jordan		
Jordan FDA	✓					✓
Project advisor on zoonotic diseases; data analyses; implementation support; Tasks 2-6				*Wail Hayajneh*, MBBS (MD), Chairman, Infectious Diseases Comm., Jordan FDA		

IV: RELEVANCE

The USAID PREDICT-2 Jordan team in collaboration with FAO, Kansas State University, and the National Institute of Health (NIH)'s Rocky Mountain Laboratories conducted a nationwide study where blood samples from camels in Ramtha and Azrak were collected and tested against MERS-Cov. Out of 120 samples, 36 were positive. This was the first-ever report of this disease to OIE in camels in Jordan. To date, only few countries have reported virus-positive MERS-CoV test results to the OIE so this is a significant and important step in improving both MERS-CoV detection and reporting in the Middle East. Furthermore, MOH sampled humans from two sites to screen for MERS-CoV where 2 samples were confirmed positive. This demonstrates One Health in action in Jordan led by the JUST/EHA PREDICT-2 team. These results were published under the title "High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan".[20] There are no reports of human leptospirosis in Jordan. However, a recently published article showed that approximately 27% and 53% of apparently healthy dairy cows and recently aborted cows are seropositive to Leptospira Hardo and Pomona.[10] Therefore, a serious outbreak of human leptospirosis could occur due to close contact between humans and dairy cows in the country. Regarding brucellosis, a study revealed that people who milk sheep and goats, consume raw feta cheese made from sheep and goat milk, consume raw cows' milk, and boiled feta cheese are more likely to be treated for brucellosis.[21]

V. CREDENTIALS

PI: Dr. William Karesh is the Executive Vice President for Health and Policy at EHA. He serves as the President of the OIE Working Group on Wildlife Diseases and on the WHO IHR Roster of Experts. Dr. Karesh has served as PI on several large-scale, multi-partner projects, including two DTRA-funded projects on RVF in South Africa, and as Technical Director and EPT Partners Liaison for the USAID Emerging Pandemic Threats PREDICT and PREDICT-2 projects, together a $200+ million effort focused on predicting and preventing pandemic diseases. Dr. Karesh coined the term One Health in 2004 and has pioneered initiatives focusing attention and resources on solving problems using the One Health approach linking public health, agriculture and environmental health agencies and organizations around the world. He has created, directed and managed projects and programs in 56 countries, including efforts to minimize the impact of diseases such as RVF, Ebola, avian influenza, and anthrax as well as supporting global surveillance systems for emerging diseases. He is a leading global expert on MERS, recently serving on the OIE *ad hoc* group on MERS-CoV, and assisted the Kingdom of Saudi Arabia in implementing MERS investigations in animals. He is currently Co-PI of the DTRA BTRP West Asia Bat Research Network, which will promote project synergies in the region.

Prime Organization: EcoHealth Alliance (EHA) is a science-based organization incorporated over 45 years ago, currently working with local partners in over 20 countries at the nexus of human, animal, and environmental health. EHA's staff in New York includes leading scientists from a wide range of disciplines (veterinarians, epidemiologists, diagnostic experts, modelers, economists, social scientists, ecologists, analysts and IT researchers), and administrative and communications staff. EHA has an extensive record of publishing high-quality, peer-reviewed papers, journals, and briefing documents. Our team led development of a human behavioral risk surveillance protocol and questionnaire that has now been implemented in 28 hotspot countries for disease emergence.

JUST: Co-I Dr. Abu-Basha has led several projects related to emerging zoonotic infectious diseases including "Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria" and "Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan". He was also country project lead and country coordinator of the USAID PREDICT-2 Project, which was concerned with developing a global early warning system to detect, track, and predict the emergence of new zoonotic pathogens from wildlife that could pose a threat to human health. The MBVL/JUST laboratory is an important hub for training and preparing future scientists to perform techniques from sample handling to DNA extraction, cDNA synthesis, performing PCR protocols, cloning, plasmid purification, and sequencing analysis.

Human Link: Co-I Dr. Kayali has extensive experience on both MERS and Avian Influenza in the Middle East and Africa, conducting surveillance for avian influenza and MERS-CoV in humans and different animal species in several countries in the Middle East and Africa. He oversees two virology laboratories, one in Egypt at the National Research Centre in Egypt to be used in this project and one in Lebanon. Dr. Kayali is a world-renowned SME for influenza and coronaviruses. He is part of the NIAID CEIRS network and DTRA/GCRF CANARIES network and served as USAID PREDICT-2 lead for Egypt.

US CDC: Co-Investigator Dr. Patrick Dawson worked for EHA for 3 years overseeing the Jordan PREDICT-2 project work on viral zoonoses. As an EIS officer at CDC, he will be serving as project advisor on zoonotic diseases, and after Year 2, providing data analyses and dissemination. **Jordanian Ministry of Agriculture**'s Chief Veterinary Officer Dr. Mahmoud Alhanatleh served as an advisor on the USAID EPT PREDICT-2 project for the animal studies components. He will continue in this role for the proposed project. **Jordanian Food and Drug Administration** Chairman of the Infectious Diseases Committee Dr. Wail Hayajneh is a subject matter expert on zoonotic diseases, former dean of the JUST School of Medicine, and served as an advisor on the USAID EPT PREDICT-2 project. He will continue as a project advisor for the proposed project and serve as a liaison with the Jordanian government.

VI: WORK TO BE PERFORMED

Year 1:

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and poultry in Jordan. *Subtasks*: (Format: Year #. Task #. Subtask #)

1.1.1 Identify sites for project study. **1.1.2** Obtain local permissions and approvals to work with animals. **1.1.3** Conduct biological sampling of animals in the study areas. **1.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description and execution: **1) Study sites:** Within each of the five study regions, sites will be selected as described in the methods section. **2) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research

with animals. As part of obtaining local permissions we will also meet with community leaders, owners of animals, and poultry production facility managers. **3) Conduct biological sampling of animals:** Nasopharyngeal and oropharyngeal swabs will be collected from 300 camels, poultry and other livestock quarterly in Y1, Q3-Q4 as described above. Blood samples will be collected from 300 animals in Y1, Q3 as described above. **4) Conduct laboratory testing** for pathogens in Y1, Q3 and Q4 as described above. Laboratory security details are indicated in the PRAT form.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 7 laboratory scientists and veterinarians (conduct field and laboratory work, coordinate field and laboratory activities); **HL:** 1 research scientist, (laboratory technical advisor, laboratory training, data analysis); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Selection of study sites; Permits and ethical clearance obtained for animal studies; Project staff trained; Animal sampling implemented; Sample testing implemented.
Deliverable: animal test results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection.

Subtasks: **1.2.1** Identify sites and conduct enrollment for human study component. **1.2.2** Obtain approvals to work with human subjects. **1.2.3** Conduct biological sampling. **1.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description and execution: **1) Study sites and enrollment:** Based on site selection, people living or working in one of the 5 regions during the first, second, or third visits (until sample targets are reached) will be eligible for recruitment in the study as described above. **2) Local permissions:** Once U.S. ethical approval is finalized, we will submit protocols for local ethical clearance and permits to conduct research with human subjects. As part of obtaining local permissions we will also meet with community leaders and poultry production facility managers. **3) Human biological sampling:** Nasopharyngeal and oropharyngeal swabs will be collected from 300 people quarterly in Y1, Q3 and Q4 as described above. Blood samples will be collected from 300 people in Y1, Q3 as described above. **4) Conduct laboratory testing** for pathogens in Y1, Q3 and Q4 as described above. Laboratory security details are indicated in the PRAT form.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 7 laboratory scientists and medical doctor (conduct and coordinate field and laboratory work, organize partner and stakeholder meetings, coordinate field and laboratory activities); **HL:** 1 research scientist, 1 laboratory technician (human serology, laboratory training, data analysis); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Local permissions obtained to conduct human study; Project staff trained; Human sampling implemented; Sample testing implemented.
Deliverable: Human test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.

Subtasks: **1.3.1** Obtain local permissions and approvals to work with human subjects. **1.3.2** Conduct behavioral risk factor surveys in people. **1.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description and execution: **1) Local permissions:** Develop owner/worker questionnaire for the behavioral survey. Once U.S. ethical approval is finalized, submit protocols for local ethical clearance and permits to conduct research as described in methods section and obtain concurrence from local community leaders. **2) Conduct behavioral surveys:** Conduct

behavioral survey on 300 people in Y1, Q3 and brief follow-up survey in Q4 as described in the Methods. **3) Data analysis:** Preliminary data analysis will begin in Y1, Q3 and continue in Q4.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 5 research scientists and medical doctor (conduct behavioral work, coordinate field activities); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Obtain local permissions to conduct behavioral risk study; Questionnaire app developed; Project staff trained; behavioral study implemented.
Deliverable: Behavioral risk factor study initiated.

Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.

Subtasks: **1.4.1** Generate geospatial maps of laboratory results. **1.4.2** Generate geospatial risk maps by addition of human behavioral risk data.
Description and execution: **1) Geospatial maps**: Lab results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated quarterly beginning Y1, Q3 and shared with USG/DTRA and Jordanian project partners. **2) Risk maps:** Use statistical models to link human behavioral data to laboratory findings beginning in Y1, Q4 and share with USG/DTRA and Jordanian project partners.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 5 research scientists (design methodology, conduct data collection and analyses); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Compile data; Develop models and conduct analyses; Develop and update geospatial maps and risk maps.
Deliverable: Initial geospatial maps and risk maps produced and shared.

Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.

Subtasks: **1.5.1** Conduct project kick-off meeting in Amman with local stakeholders. **1.5.2** Train local project staff in proper techniques. **1.5.3** Host annual partners and stakeholders meeting. **1.5.4** Complete annual report and share with project partners and local stakeholders. **1.5.5** Conduct training workshops. **1.5.6** Data management. **1.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description and execution: **1) Project kick-off meeting:** Government partners and stakeholders will be invited to a project launch meeting to be held in Amman in Y1, Q1. **2) Train local project staff in proper techniques:** Before the field studies we will train (Y1)/retrain (OY1) our One Health field team as described above and in Attachment 3. **3) Annual partners and stakeholders meeting:** We will host an annual Stakeholders and Partners Meeting to inform stakeholders of our progress and receive feedback and input on the project. For this meeting we will invite local and national representatives of public health, veterinary health, environmental health/sciences, medical and laboratory officers as well as community leaders. To be held in Amman Y1, Q4. **4) Annual Report:** compiled and delivered at the end of Y1, Q4. **5) Training Workshops:** To be held as described in Technical Narrative and Attachment 3 in Y1, Q2. **6) Data management:** A database will be developed, used for epidemiological analyses and shared among implementing partners (including government partners). While sensitive human data will remain protected, we will work with government partners and stakeholders to provide aggregated data as requested. Biobank sample repository information will be maintained in a DTRA-

specified format and all samples and data generated during the course of the project will be available for at least 12 months after the project end date. Scientific and general reports will be generated. **7) Presentations and Meetings:** Project participants will attend DTRA Annual Technical Review as requested and other national or international meetings such as the International Meeting on Emerging Diseases or ASM Biothreats.
Resources: **EHA:** 4 research scientists (conduct trainings, support JUST scientists, support workshops, ensure the curation and analysis of data); **JUST:** 9 scientists and technicians (organize and support training workshops, organize partner and stakeholder meetings); **HL:** 1 research scientist (training in laboratory techniques and analyses); **CDC:** 1 research scientist (training in methods and data analyses).
Metrics of success: Training workshops completed; Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Participation in DTRA and scientific meetings.
Deliverable: Trained project personnel, communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.
Year 2:
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.
Subtasks: **2.1.3** Conduct biological sampling in animals within the study area. **2.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 1 except: **3) Biological sampling of animals:** Swabs will be collected from 300 camels, poultry and other livestock quarterly in Y2. No blood samples collected in Y2. **4) Laboratory testing:** performed quarterly in Y2 (PCR testing only).
Metrics of success: Animal sampling conducted; Sample testing conducted.
Deliverable: Animal sampling and testing conducted; Test results report produced and shared.
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection.
Subtasks: **2.2.3** Conduct biological sampling of people within the study area. **2.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 1 except: **3) Human biological sampling:** Swabs will be collected from 300 people quarterly. No blood samples will be collected from people in Y2. **4) Conduct laboratory testing:** performed quarterly in Y2 (PCR testing only).
Metrics of success: Participants re-enrolled; Human sampling conducted; Sample testing conducted.
Deliverable: Human sampling and testing conducted; Test results report produced and shared.
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **2.3.2** Conduct behavioral risk factor surveys in people. **2.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources: as in Year 1 except: **2) Conduct behavioral surveys:** Conduct brief follow-up behavioral survey (subset of larger survey with ethical clearance obtained) on 300 people in Y2, Q3. **3) Data analysis:** Data analysis will be conducted quarterly.
Metrics of success: Develop app for follow-up behavioral survey; Project staff re-trained; behavioral study conducted.
Deliverable: Behavioral risk factor study results report produced and shared.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human

zoonotic transmission risk.

Subtasks: **2.4.1** Generate geospatial maps of laboratory results. **2.4.2** Generate geospatial risk maps by addition of human behavioral risk data.

Description, execution and resources: as in Year 1 except: **1) Geospatial maps:** Lab results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and updated quarterly and shared with USG/DTRA and Jordanian project partners. **2) Generate geospatial risk maps:** Use statistical models to link human behavioral data to laboratory findings quarterly and share with USG/DTRA and Jordanian project partners.

Metrics of success: Update geospatial maps and risk maps; Share with project partners.

Deliverable: Updated geospatial maps and risk maps produced and shared.

Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.

Subtasks: **2.5.3** Host annual partners and stakeholders meeting. **2.5.4** Complete annual report and share with partners and stakeholders. **2.5.5** Conduct training workshops. **2.5.6** Data management. **2.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Description, execution and resources: as in Year 1 except: **3) Annual partners and stakeholders meeting:** to be held in Amman Y2, Q4. **4) Annual Report:** compiled and delivered at the end of Y2, Q4. **5) Training Workshops:** To be held as described in the Technical Narrative and Attachment 3 in Y2, Q3 as a regional workshop.

Metrics of success: Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.

Deliverable: Training workshop conducted, communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.

Year 3:

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.

Subtasks: **3.1.3** Conduct biological sampling in animals within the study area. **3.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description, execution and resources: as in Year 2 except: **3) Biological Sampling:** Blood samples will be collected in Y3, Q1. **4) Conduct laboratory testing:** Serology will be tested in Y3, Q1.

Metrics of success: Animal sampling conducted; Sample testing conducted.

Deliverable: Animal sampling and testing conducted; Test results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **3.2.3** Conduct biological sampling of in people within the study area. **3.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description, execution and resources: as in Year 2 except: **3) Human biological sampling:** Blood samples will be collected from people in Y3, Q1. **4) Conduct laboratory testing:** Serology will be tested in Y3, Q1.

Metrics of success: Participants re-enrolled; Human sampling conducted; Sample testing conducted.

Deliverable: Human sampling and testing conducted; Test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **3.3.2** Conduct behavioral risk factor surveys in people. **3.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources as in Year 2.
Metrics of success: Project staff re-trained; behavioral study conducted.
Deliverable: Behavioral risk factor study results report produced and shared.
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **3.4.1** Generate geospatial maps of laboratory results. **3.4.2** Generate geospatial risk maps with addition of human behavioral risk data.
Description, execution and resources as in Year 2.
Metrics of success: Update geospatial maps and risk maps; Share with project partners.
Deliverable: Updated geospatial maps and risk maps produced and shared.
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **3.5.3** Host annual partners and stakeholders meeting. **3.5.4** Complete annual report and share with project partners and local stakeholders. **3.5.6** Data management. **3.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Year 2 except: **3) Annual partners and stakeholders meeting:** to be held in Amman Y3, Q4. **4) Annual Report:** compiled and delivered the end of Y3, Q4. **5) Training Workshops:** no training workshops to be held in Y3.
Metrics of success: Hosting of project meetings; annual report with sample repository data to DTRA Thrust Area 6; reports to stakeholders; Participation in DTRA and scientific meetings.
Deliverable: Communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses.
Subtasks: **3.6.1** Conduct causal inference analyses based on data from Task 1, 2, 3. **3.6.2** Share results of analyses at annual partners and stakeholders meeting. **3.6.3** Submit written report to DTRA, local partners and stakeholders.
Description and execution: **1) Causal inference analyses:** as described in technical narrative. **2) Share Results:** at annual partners and stakeholder meeting Y3, Q4. **3) Written Report:** Results of analyses with identification and recommendations on modifiable risk factors delivered Y3,Q4.
Resources: **EHA:** 3 research scientists (design methodology, support JUST scientists, support workshops, coordinate activities between collaborators, ensure the curation and analysis of data); **JUST:** 4 research scientists (conduct data collection and analyses, support training workshops, organize partner meetings); **CDC:** 1 research scientist (methods oversight, data analysis).
Metrics of success: Initiate causal inference analyses; Deliver report to project partners and stakeholders on modifiable risk factors.
Deliverable: Causal inference analysis report produced and shared.
Option Year 1
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan. *Subtasks*: **O1.1.3** Conduct biological sampling of animals within the study area. **O1.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in Year 3 except: **3) Biological Sampling:** Swabs will be collected in Q1, Q2, Q3 and blood samples will be collected from 300 animals in OY1, Q3.
Metrics of success: Project staff re-trained; Animal sampling and testing conducted.

Deliverable: Animal sampling completed; Test results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **O1.2.3** Conduct biological sampling within the study area. **O1.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

Description, execution and resources: as in Year 3 except: **3) Human biological sampling:** Swabs will be collected in OY1 Q1, Q2, Q3 and blood samples will be collected from 300 people in OY1, Q3.

Metrics of success: Project staff re-trained; Participants re-enrolled; Human sampling conducted; Sample testing conducted.

Deliverable: Human sampling and testing conducted; Test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses. *Subtasks*: **O1.3.2** Conduct behavioral risk factor surveys in people. **O1.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.

Description, execution and resources: as in Year 3 except: **1) Behavioral surveys**: will be conducted in OY1 Q1, Q2, Q3.

Metrics of success: Project staff re-trained; Behavioral study conducted.

Deliverable: Behavioral risk factor study surveys completed; Results report shared.

Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **O1.4.1** Generate geospatial maps of laboratory results. **O1.4.2** Generate geospatial risk maps by addition of human behavioral risk data.

Description, execution and resources as in Year 3.

Metrics of success: Update geospatial maps and risk maps; shared with project partners.

Deliverable: Geospatial maps and risk maps produced and shared with partners.

Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops. *Subtasks*: **O1.5.2** Train local project staff in proper techniques. **O1.5.3** Host annual partners and stakeholders meeting. **O1.5.4** Complete annual report and share with project partners and local stakeholders. **O1.5.5** Conduct local/regional training workshops. **O1.5.6** Data management. **O1.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

Description, execution and resources: as in Y1 except: **2) Train local project staff:** retraining. **3) Annual partners and stakeholders meeting:** to be held in Amman OY1, Q4. **4) Annual Report:** compiled and delivered at the end of OY1, Q4. **5) Training Workshops:** To be held as described in the Technical Narrative and Attachment 3 in OY1, Q3 as a regional workshop.

Metrics of success: Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.

Deliverable: Communication via reports to the funder, scientific community and stakeholders. Biobank sample repository information maintained in a DTRA-specified format.

Task 6: Identify specific modifiable risk factors for human infection with these zoonoses. *Subtasks*: **O1.6.1** Conduct causal inference analyses based on Task 1, 2, 3. **O1.6.2** Share results of analyses at annual partners and stakeholders meeting.

Description, execution and resources: as in Y3 except: **1) Conduct causal inference analyses:** continue as described in the Technical Narrative. **2) Share Results:** updated results at annual partners and stakeholder meeting OY1, Q4.

Metrics of success: Conduct causal inference analyses; Deliver report to project partners and stakeholders on modifiable risk factors.
Deliverable: Causal inference analysis report produced and shared.

Option Year 2

Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan. *Subtasks*: **O2.1.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in OY1 except: **4) PCR and Serology testing:** to be completed by end of OY2, Q2.
Metrics of success: Animal sample testing conducted and completed.
Deliverable: Animal testing results report produced and shared.

Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses. *Subtasks*: **O2.2.4** Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.
Description, execution and resources: as in OY1 except: **4) PCR and Serology testing:** to be completed by end of OY2, Q2.
Metrics of success: Human sample testing conducted and completed.
Deliverable: Human sample testing final test results report produced and shared.

Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses.
Subtasks: **O2.3.3** Analyze epidemiologic causal inference to identify modifiable risk factors.
Description, execution and resources: as in OY1 except: analysis of survey results be completed by end of OY2, Q4.
Metrics of success: Conduct analysis of epidemiologic causal inference.
Deliverable: Behavioral risk factor study analyses completed; Final results report generated with identified modifiable risk factors and delivered to partners and stakeholders.

Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk. *Subtasks*: **O2.4.1** Generate geospatial maps of laboratory results. **O2.4.2** Generate risk maps by addition of human behavioral risk data.
Description, execution and resources: as in OY1 except: to be completed by end of OY2, Q4. Geo-spatial analysis technology will be transferred in the regional workshop on geospatial analysis (Task 5).
Metrics of success: Update geospatial maps and risk maps; shared with project partners.
Deliverable: Completed final geospatial maps and risk maps.

Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.
Subtasks: **O2.5.3** Host annual partners and stakeholders meeting. **O2.5.4** Complete annual report and share with project partners and local stakeholders. **O2.5.5** Conduct local/regional training workshops. **O2.5.6** Data management. **O2.5.7** Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.
Description, execution and resources: as in Y3 except: **3) Annual partners and stakeholders meeting:** to be held in Amman OY2, Q4. **4) Annual Report:** compiled and delivered at the end of OY2, Q4. **5) Training Workshops:** To be held as described in Technical Narrative and Attachment 3 in OY2, Q3 as a regional workshop.
Metrics of success: Hosting of project meetings; Completion of annual report with sample repository data to DTRA Thrust Area 6; Completed report to local stakeholders; Hosting of training workshops; Participation in DTRA and scientific meetings.

Deliverable: Biobank sample repository information maintained in a DTRA-specified format. Final project reports delivered to partners, stakeholders and DTRA.

Task 6: Identify specific modifiable risk factors for human infection with these zoonoses.

Subtasks: **O2.6.1** Conduct causal inference analyses based on Task 1, 2, 3. **O2.6.2** Share results of analyses at annual partners and stakeholders meeting. **O2.6.3** Submit written report to DTRA and local partners and stakeholders.

Description, execution and resources: as in OY1 except: **1) Final causal inference analyses:** continue and complete as described in technical narrative by end of OY2, Q4. **2) Final Results:** final results provided at annual partners and stakeholder meeting OY2, Q4. **3) Final Written Report:** Final analyses results with identification and recommendations on modifiable risk factors delivered at end of OY2, Q4.

Metrics of success: Complete causal inference analyses; Deliver final report to project partners and stakeholders on modifiable risk factors.

Deliverable: Generate and deliver written report of analyses with identification and recommendations on modifiable risk factors.

VII: PERFORMANCE SCHEDULE

Task	Year 1	Year 2	Year 3	OY 1	OY 2
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan					
1.1. Identify sites for project study					
1.2 Obtain local permissions and approvals to work with animals					
1.3 Conduct biological sampling in animals within the study area					
1.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection					
2.1 Identify sites and conduct enrollment for human study component					
2.2 Obtain local permissions and approvals to work with human subjects					
2.3 Conduct biological sampling					
2.4 Conduct testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses					
3.1 Obtain local permissions and approvals to work with human subjects					
3.2 Conduct behavioral risk factor surveys in people					
3.3 Analyze epi causal inference to identify modifiable risk factors					
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk					
4.1 Generate maps of laboratory results					
4.2 Generate risk maps with human beh. risk data					
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon					
5.1 Conduct project kick-off meeting in Amman with local stakeholders					
5.2 Train local project staff in proper techniques					
5.3 Host annual partners and stakeholders meeting					
5.4 Complete annual report and share with partners and stakeholders					
5.5 Conduct local/regional training workshops					
5.6 Data management					
5.7 Conduct presentations/meetings at times and places specified					
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses					
6.1 Conduct causal inference analyses based on Task 1, 2, 3					
6.2 Share results of analyses at annual partners and stakeholders meeting					
6.3 Submit written report to DTRA and local partners and stakeholders					

Confirmed Proposal Expiration Date. "EHA holds the proposal, to include proposed costs, firm for 180 days after the submission due date, as included in the invitation to submit a full proposal."

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RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 1** **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,109.00	2.00			47,351.50	16,762.43	64,113.93
Project Role:	PD/PI										
	Catherine		Machalaba		83,790.00	6.00			41,895.00	14,830.83	56,725.83
Project Role:	Co I										
	Emily		Hagan		68,000.00	3.00			17,000.00	6,018.00	23,018.00
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		91,740.00	2.50			19,112.50	6,765.83	25,878.33
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 169,736.09

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			27,853.00	9,859.96	37,712.96
1	Research Assistant	12.00			61,000.00	21,594.00	82,594.00
2	**Total Number Other Personnel**					**Total Other Personnel**	120,306.96

Total Salary, Wages and Fringe Benefits (A+B) 290,043.05

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	11,582.50
2. Foreign Travel Costs	60,785.50
Total Travel Cost	72,368.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	6,600.00
2.	Publication Costs	
3.	Consultant Services	4,500.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	489,312.86
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	500,412.86

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	862,823.91

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - Direct	32.00		119,523.54
Indirect - Subcontractors	32.00		12,561.92
	Total Indirect Costs		132,085.46

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	994,909.37

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	994,909.37

L. Budget Justification

(Only attach one file.) 1234-Budget Justification_FEA.pdf | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,109.00	2.00			49,719.08	17,600.55	67,319.63
Project Role:	PD/PI										
	Catherine		Machalaba		83,790.00	6.00			43,989.75	15,572.37	59,562.12
Project Role:	Co I										
	Emily		Hagan		68,000.00	3.00			17,850.00	6,318.90	24,168.90
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		91,740.00	1.20			9,632.70	3,409.98	13,042.68
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 164,093.33

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			29,245.65	10,352.96	39,598.61
1	Research Assistant	12.00			64,050.00	22,673.70	86,723.70
2	**Total Number Other Personnel**					**Total Other Personnel**	126,322.31

Total Salary, Wages and Fringe Benefits (A+B) 290,415.64

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	11,582.50
2. Foreign Travel Costs	59,885.50
Total Travel Cost	71,468.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	600.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	506,071.55
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	513,671.55

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	875,555.19

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect Direct	32.00		118,234.76
		Total Indirect Costs	118,234.76

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	993,789.95

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	993,789.95

L. Budget Justification

(Only attach one file.) 1234 Budget Justification_EHA.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,109.00	2.00			52,205.03	18,480.58	70,685.61
Project Role:	PD/PI										
	Catherine		Machalaba		83,790.00	6.00			46,189.24	16,350.99	62,540.23
Project Role:	Co I										
	Emily		Hagan		68,000.00	3.00			18,742.50	6,634.85	25,377.35
Project Role:	Behavior Risk Scientist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 158,603.19

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			30,707.93	10,870.61	41,578.54
1	Research Assistant	12.00			67,252.50	23,807.39	91,059.89
2	**Total Number Other Personnel**					**Total Other Personnel**	132,638.43

Total Salary, Wages and Fringe Benefits (A+B) 291,241.62

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	11,582.50
2. Foreign Travel Costs	56,518.00
Total Travel Cost	68,100.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	600.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	511,688.31
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	519,288.31

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	878,630.43

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect - Direct	32.00		117,421.47
Indirect - Subcontractors	32.00		3,438.08
	Total Indirect Costs		120,859.55

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	999,489.98

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	999,489.98

L. Budget Justification

(Only attach one file.) 1234-Budget Justification_FRA.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000 **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period:** 4 **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,109.00	2.00			54,815.28	19,404.61	74,219.89
Project Role:	PD/PI										
	Catherine		Machalaba		83,790.00	6.00			48,438.70	17,168.54	65,667.24
Project Role:	Co I										
	Emily		Hagan		68,000.00	3.00			19,679.63	6,966.59	26,646.22
Project Role:	Behavior Risk Scientist										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 166,533.35

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			32,243.33	11,414.14	43,657.47
1	Research Assistant	12.00			70,615.13	24,997.75	95,612.88
2	**Total Number Other Personnel**					**Total Other Personnel**	139,270.35

Total Salary, Wages and Fringe Benefits (A+B) 305,803.70

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	11,582.50
2. Foreign Travel Costs	44,426.00
Total Travel Cost	56,008.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	600.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	512,371.11
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	519,971.11

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	881,783.31

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect Direct	32.00		118,211.90
		Total Indirect Costs	118,211.90

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	999,995.21

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	999,995.21

L. Budget Justification

(Only attach one file.) 1234 Budget Justification_EHA.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 077090066000C **Enter name of Organization:** EcoHealth Alliance

Budget Type: ☒ Project ☐ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	William		Karesh		284,109.00	2.00			57,556.04	20,374.84	77,930.88
Project Role:	PD/PI										
	Catherine		Machalaba		83,790.00	7.00			59,410.91	21,031.46	80,442.37
Project Role:	Co I										
	Emily		Hagan		68,000.00	3.00			20,663.61	7,314.92	27,978.53
Project Role:	Behavior Risk Scientist										
Dr.	Whitney		Bagge		91,740.00	1.20			11,131.03	3,947.47	15,098.52
Project Role:	Modeler										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 201,450.30

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Operations Assistant	6.00			33,855.50	11,984.85	45,840.35
1	Research Assistant	12.00			74,145.88	26,247.64	100,393.52
2	**Total Number Other Personnel**					**Total Other Personnel**	146,233.87

Total Salary, Wages and Fringe Benefits (A+B) 347,684.17

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	11,582.50
2. Foreign Travel Costs	52,446.50
Total Travel Cost	64,029.00

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	600.00
2.	Publication Costs	6,000.00
3.	Consultant Services	1,000.00
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	434,003.40
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.		
9.		
10.		
	Total Other Direct Costs	441,603.40

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	853,316.57

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect Direct	32.00		134,180.21
		Total Indirect Costs	134,180.21

Cognizant Federal Agency
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	987,496.78

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	987,496.78

L. Budget Justification

(Only attach one file.) 1234 Budget Justification_EHA.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		860,416.26
Section B, Other Personnel		664,771.92
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		1,525,188.18
Section C, Equipment		
Section D, Travel		331,974.00
1. Domestic	57,912.50	
2. Foreign	274,061.50	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		2,494,947.23
1. Materials and Supplies	9,000.00	
2. Publication Costs	24,000.00	
3. Consultant Services	8,500.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	2,453,447.23	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		4,352,109.41
Section H, Indirect Costs		623,571.88
Section I, Total Direct and Indirect Costs (G + H)		4,975,681.29
Section J, Fee		
Section K, Total Costs and Fee (I + J)		4,975,681.29

OMB Number: 4040-0001
Expiration Date: 10/31/2019

10 YEAR R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Instructions: On this form, you will attach the 10 Year R&R Subaward Budget files for your grant application. Complete the subawardee budget(s) in accordance with the 10 Year R&R budget instructions. Please remember that any files you attach must be a PDF document.

Click here to extract the 10 Year R&R Subaward Budget Attachment

Important: Please attach your subawardee budget file(s) with the file name of the subawardee organization. Each file name must be unique.

1) Please attach Attachment 1	JUST		Delete Attachment	View Attachment
2) Please attach Attachment 2	Human Link		Delete Attachment	View Attachment
3) Please attach Attachment 3		Add Attachment		
4) Please attach Attachment 4		Add Attachment		
5) Please attach Attachment 5		Add Attachment		
6) Please attach Attachment 6		Add Attachment		
7) Please attach Attachment 7		Add Attachment		
8) Please attach Attachment 8		Add Attachment		
9) Please attach Attachment 9		Add Attachment		
10) Please attach Attachment 10		Add Attachment		

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 043805972 0000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	2.00			8,000.00	0.00	8,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 224,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	2.00			11,200.00	0.00	11,200.00

8	Total Number Other Personnel	Total Other Personnel	24,500.00
		Total Salary, Wages and Fringe Benefits (A+B)	249,400.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)
Vehicle	35,000.00

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	35,000.00

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	22,330.00
2. Foreign Travel Costs	37,333.50
Total Travel Cost	59,663.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	35,158.96
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	40,300.00
9.	Meetings and Conferences	20,345.00
10.		
	Total Other Direct Costs	95,803.96

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	439,867.46

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		35,189.40
		Total Indirect Costs	35,189.40

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	475,056.86

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	475,056.86

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_JUST.pdf [Delete Attachment] [View Attachment]

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 043805971000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	4.00			22,400.00	0.00	22,400.00

8	Total Number Other Personnel	Total Other Personnel	35,700.00
		Total Salary, Wages and Fringe Benefits (A+B)	300,600.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	38,080.00
2. Foreign Travel Costs	25,150.50
Total Travel Cost	63,230.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	18,784.77
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	53,500.00
9.	Meetings and Conferences	32,469.50
10.		
	Total Other Direct Costs	104,754.27

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	468,584.77

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		37,486.78
		Total Indirect Costs	37,486.78

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	506,071.55

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	506,071.55

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_JUST.pdf

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 043805971000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	1.00			5,000.00	0.00	5,000.00
2	Nurses	4.00			22,400.00	0.00	22,400.00

8	Total Number Other Personnel	Total Other Personnel	35,700.00
		Total Salary, Wages and Fringe Benefits (A+B)	300,600.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	38,080.00
2. Foreign Travel Costs	37,333.50
Total Travel Cost	75,413.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	7,666.97
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	64,300.00
9.	Meetings and Conferences	12,605.00
10.		
	Total Other Direct Costs	84,571.97

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	460,585.47

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		36,846.84
		Total Indirect Costs	36,846.84

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	497,432.31

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	497,432.31

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_JUST.pdf

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 043805972000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	2.00			10,000.00	0.00	10,000.00
2	Nurses	3.00			16,800.00	0.00	16,800.00

8	Total Number Other Personnel	Total Other Personnel	35,100.00
		Total Salary, Wages and Fringe Benefits (A+B)	300,000.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file	
Total Equipment	

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	30,205.00
2. Foreign Travel Costs	29,751.50
Total Travel Cost	59,956.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	10,255.19
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	52,300.00
9.	Meetings and Conferences	32,469.50
10.		
	Total Other Direct Costs	95,024.69

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	454,981.19

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		36,398.50
		Total Indirect Costs	36,398.50

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	491,379.69

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	491,379.69

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_JUST.pdf

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 043805971000 **Enter name of Organization:** Jordan University of Science and Technology

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ehab		Abu Basha		128,400.00	12.00			128,400.00	0.00	128,400.00
Project Role:	Co PI										
	Bani		Talafha		48,000.00	8.00			32,000.00	0.00	32,000.00
Project Role:	Biologist										
	Zaidoun		Hijazeen		48,000.00	12.00			48,000.00	0.00	48,000.00
Project Role:	Veterinarian										
Dr.	Mustafa		Ababneh		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Virologist										
	Zuhair	Bani	Israil		60,000.00	2.50			12,500.00	0.00	12,500.00
Project Role:	Livestock ID Expert										
Dr.	Borhan		Al-Zoghoul		60,000.00	3.00			15,000.00	0.00	15,000.00
Project Role:	Molecular Biologist										
	Bilal		Al Orari		36,000.00	3.00			9,000.00	0.00	9,000.00
Project Role:	Laboratory Supervisor										
	Wail		Mayajneh		60,000.00	1.00			5,000.00	0.00	5,000.00
Project Role:	Human ID Expert										

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 264,900.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
2	Graduate Students				1,000.00	0.00	1,000.00
2	Undergraduate Students				1,000.00	0.00	1,000.00
1	Secretarial/Clerical	3.50			6,300.00	0.00	6,300.00
1	Saad Gharaibeh, Avian Pathologist	2.00			10,000.00	0.00	10,000.00
6	**Total Number Other Personnel**					**Total Other Personnel**	18,300.00
						Total Salary, Wages and Fringe Benefits (A+B)	283,200.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	3,860.00
2. Foreign Travel Costs	32,732.50
Total Travel Cost	36,592.50

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees	**Total Participant/Trainee Support Costs**

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.	Meetings and Conferences	78,212.50
10.		
	Total Other Direct Costs	78,212.50

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	398,005.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		31,840.40
		Total Indirect Costs	31,840.40

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	429,845.40

J. Fee

Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	429,845.40

L. Budget Justification

(Only attach one file.) 1271-Budget Justification_JUST.pdf

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		1,284,500.00
Section B, Other Personnel		149,300.00
Total Number Other Personnel	38	
Total Salary, Wages and Fringe Benefits (A+B)		1,433,800.00
Section C, Equipment		35,000.00
Section D, Travel		294,856.50
1. Domestic	132,555.00	
2. Foreign	162,301.50	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		456,367.39
1. Materials and Supplies	71,865.89	
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	210,400.00	
9. Other 2	176,101.50	
10. Other 3		
Section G, Direct Costs (A thru F)		2,222,023.89
Section H, Indirect Costs		177,761.92
Section I, Total Direct and Indirect Costs (G + H)		2,399,785.81
Section J, Fee		
Section K, Total Costs and Fee (I + J)		2,399,785.81

RESEARCH & RELATED BUDGET - Budget Period 1

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period:** 1 **Start Date:** 01/01/2020 **End Date:** 12/31/2020

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali						0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	13,200.00
9.		
10.		
	Total Other Direct Costs	13,200.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	13,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		1,056.00
		Total Indirect Costs	1,056.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,256.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,256.00

L. Budget Justification

(Only attach one file.) 1272 Budget Justification_Human Link | Delete Attachment | View Attachment

RESEARCH & RELATED BUDGET - Budget Period 2

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 2** **Start Date:** 01/01/2021 **End Date:** 12/31/2021

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali						0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

	Funds Requested ($)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs

	Funds Requested ($)
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
Number of Participants/Trainees / Total Participant/Trainee Support Costs	

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Testing	0.00
9.	
10.	
Total Other Direct Costs	0.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	0.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
		Total Indirect Costs	

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	0.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	0.00

L. Budget Justification

(Only attach one file.) 1272 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 3

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 3** **Start Date:** 01/01/2022 **End Date:** 12/31/2022

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali						0.00	0.00	0.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 0.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees / **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	13,200.00
9.		
10.		
	Total Other Direct Costs	13,200.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	13,200.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		1,056.00
		Total Indirect Costs	1,056.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	14,256.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	14,256.00

L. Budget Justification

(Only attach one file.) 1272 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 4

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 4** **Start Date:** 01/01/2023 **End Date:** 12/31/2023

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali						3,850.00	0.00	3,850.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,850.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 3,850.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	2,386.50
	Total Travel Cost	2,386.50

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Number of Participants/Trainees — **Total Participant/Trainee Support Costs**	

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	13,200.00
9.		
10.		
	Total Other Direct Costs	13,200.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	19,436.50

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		1,554.92
		Total Indirect Costs	1,554.92

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	20,991.42

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	20,991.42

L. Budget Justification

(Only attach one file.) 1272 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Budget Period 5

OMB Number: 4040-0001
Expiration Date: 10/31/2019

ORGANIZATIONAL DUNS: 557981896600000 **Enter name of Organization:** Human Link

Budget Type: ☐ Project ☒ Subaward/Consortium **Budget Period: 5** **Start Date:** 01/01/2024 **End Date:** 12/31/2024

A. Senior/Key Person

Prefix	First	Middle	Last	Suffix	Base Salary ($)	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Dr.	Ghazi		Kayali						3,850.00	0.00	3,850.00

Project Role: Co Investigator

Additional Senior Key Persons: Add Attachment

Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 3,850.00

B. Other Personnel

Number of Personnel	Project Role	Months Cal.	Months Acad.	Months Sum.	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						

Total Number Other Personnel

Total Other Personnel

Total Salary, Wages and Fringe Benefits (A+B) 3,850.00

C. Equipment Description

List items and dollar amount for each item exceeding $5,000

Equipment item	Funds Requested ($)

Additional Equipment: Add Attachment

Total funds requested for all equipment listed in the attached file

Total Equipment

D. Travel

		Funds Requested ($)
1.	Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	
2.	Foreign Travel Costs	
	Total Travel Cost	

E. Participant/Trainee Support Costs

		Funds Requested ($)
1.	Tuition/Fees/Health Insurance	
2.	Stipends	
3.	Travel	
4.	Subsistence	
5.	Other	
	Total Participant/Trainee Support Costs	

Number of Participants/Trainees

F. Other Direct Costs

		Funds Requested ($)
1.	Materials and Supplies	
2.	Publication Costs	
3.	Consultant Services	
4.	ADP/Computer Services	
5.	Subawards/Consortium/Contractual Costs	
6.	Equipment or Facility Rental/User Fees	
7.	Alterations and Renovations	
8.	Testing	0.00
9.		
10.		
	Total Other Direct Costs	0.00

G. Direct Costs

	Funds Requested ($)
Total Direct Costs (A thru F)	3,850.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)
Indirect	8.00		308.00
		Total Indirect Costs	308.00

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Institutional Costs (G + H)	4,158.00

J. Fee

	Funds Requested ($)

K. Total Costs and Fee

	Funds Requested ($)
Total Costs and Fee (I + J)	4,158.00

L. Budget Justification

(Only attach one file.) 1272 Budget Justification_Human Link

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals ($)
Section A, Senior/Key Person		7,700.00
Section B, Other Personnel		
Total Number Other Personnel		
Total Salary, Wages and Fringe Benefits (A+B)		7,700.00
Section C, Equipment		
Section D, Travel		2,386.50
1. Domestic		
2. Foreign	2,386.50	
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		39,600.00
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services		
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	39,600.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		49,686.50
Section H, Indirect Costs		3,974.92
Section I, Total Direct and Indirect Costs (G + H)		53,661.42
Section J, Fee		
Section K, Total Costs and Fee (I + J)		53,661.42

BUDGET JUSTIFICATION FOR ECOHEALTH ALLIANCE

EcoHealth Alliance requests a total of $4,975,681 over all-years of the proposed project to support personnel, travel, equipment, consortium agreements, and applicable indirect costs.

A. Key Personnel

William B. Karesh, D.V.M., Principal Investigator (2.0 calendar months for all years). Dr. Karesh will be responsible for the overall coordination of this project. He will provide overall project oversight, study design development and refinement, data analysis, publication support, annual stakeholder meeting participation and visits to oversee field work. We request S47,352 in Y1 due to the high cost of living in New York City we request a a 5% cost of living increase each subsequent year.

Catherine Machalaba, M.P.H., Co-Investigator (6.0 calendar months Y1-OY1, 7.0 calendar months OY2). Ms. Machalaba will be a technical advisor to the project, advising on study design and risk reduction. She to provide day-to-day project development and strategic management, including through regular in-person meetings and weekly phone and other direct communications with partners. She will also supervise field sampling, data analysis, and data and information dissemination through workshops, conferences, and papers. In OY2 she will conduct a risk reduction workshop as well as conduct a One Health economic analysis. We request S41,895 in Y1 with a 5% cost of living increase each subsequent year.

Emily Hagan, M.P.H., Behavioral Risk Scientist (3.0 calendar months in all years). Ms. Hagan will provide medical anthropology expertise for the questionnaires and analysis, supervise and conduct the IRB processes and trainings on the human subject work for local partners, and assist with data organization and analysis. We request S17,000 in Y1 with a 5% cost of living increase each subsequent year.

Whitney Bagge, Ph.D., Modeler (2.5 calendar months Y1, 1.2 calendar months in Y2, OY2). Dr. Bagge will be a technical advisor to the project, advising on data organization, analysis, and writing with a focus on statistical analytics and assist with study design in Y1, for which we request S19,113 in OY1.

B. Other Personnel

Amanda Andre, LMSW, Operations Assistant (6.0 calendar months in all years). Ms. Andre will be the administrative lead handling project management responsibilities related to budgeting, expenses, managing of subcontracts, and meeting scheduling and logistics. She will coordinate all meetings and travel and ensure compliance with funding and contractual requirements. We request S27,853 in Y1 with a 5% cost of living increase each subsequent year.

Research Assistant (12.0 calendar months in all years). A Research Assistant will be hired to assist in the development of reports, coordination of collaborators, and data cleaning, maintenance and analysis. We request $61,000 in Y1 with a 5% cost of living increase each subsequent year.

Fringe Benefits

Fringe benefits are calculated as 35.4% of base salary p.a. with $75,831 requested in Y1 calculated from the base salary for all Personnel. In Y2 OY2, we budget for a 5% per year cost of living allowance increase in all salaries.

C. Equipment
No funds are requested for equipment.

D. Travel
Domestic Travel
Domestic travel is requested for three trips per year for program staff to travel from New York City to Washington, DC for broader engagement of relevant partners and deliver presentations. EcoHealth Alliance has close relationships to the World Bank including a technical collaboration to optimize investments in health security and the application of the One Health approach. As requires, trips from New York City to Northern Virginia for two personnel to attend the CBEP meeting as included as well. Transportation is estimated at $400 per trip along with the government GSA per diem rates for Washington, DC ($251 for accommodation and $94 for meals and incidentals) and Northern Virginia ($161 for accommodation and $71 for meals and incidentals). Additional domestic travel support will facilitate EcoHealth Alliance staff presenting at a total of four domestic conferences annually. Two of these will be ASTMH in Maryland with transportation costs of $400, $157 for accommodation and $71 for meals and incidentals, along with two trips to APHA in San Diego with flights estimated at $500, $174 for accommodation and $71 for meals and incidentals. For each trip, $25 per day is estimated in taxi costs and for those that require transport to the airport $150 RT is included. In total, we are requesting $11,852 in each year of our proposed work.

International Travel
Foreign travel is requested for partner meetings, in-country trainings, and field research. Five or six EHA employees will attend annual meetings each year, depending on the year and the subjects that will be discussed at the meeting. Three EHA staff will make a second trip each year for trainings and field research. Flights for each of these trips is estimated at $1,500 and the federal per diem rates of $246 for lodging and $138 for meals in Amman, Jordan and $146 for lodging and $105 for meals while conducting field work outside of Amman, Jordan are requested. Additionally, we are requesting travel for staff to present on project findings at international conferences each year with flights estimated at $1,500 and hotels and meals at the government GSA per diem rates for Vienna, Austria for International Meeting on Emerging Diseases and Surveillance (IMED). The total requested for international travel in Y1 is $60,786.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
Co-Investigator Catherine Machalaba and the Research Assistant to be hired will both need a new computer, equipped with Microsoft and Adobe software for which we request a total of $6,000, in Y1. In order to analyze, manage, and produce graphical visualizations of data

a Stata license will be needed for which we request S600 p.a. Thus, we request a total of S9,000 over the full five years.

Publication Costs
To facilitate the dissemination of project findings, S6,000 per year in only Y2-OY2 is requested for open access publication costs in international peer-reviewed journals. This amounts to a request for $24,000 over the 5 years.

Consultant Services
For the human behavioral risk part of the project, $1,000 is requested p.a Y1-OY2 for Hummingbird IRB and $3,500 in Y1 for required Collaborative Institutional Training Initiative training for personnel handling human and non-human animals and samples as per IRB and IACUC requirements. Thus, we request a total of S8,500 over the five year project.

Subawards/Consortium/Contractual Costs
Subcontracts for the Jordan University of Science and Technology (JUST) and Human Link are outlined in their individual budget justifications.

H. Indirect Costs
We are requesting the EcoHealth Alliance federally approved indirect cost rate of 32.91% on all applicable direct costs. The USA Department of Defense's Department of the Navy has approved this rate on 17 July 2019. We have applied our indirect cost rate to the first $25,000 of the subcontracts. We request $132,086 in Y1 and S623,572 over the five years of the project.

BUDGET JUSTIFICATION FOR HUMAN LINK, LEBANON

Human Link requests a total of $53,661 over all years of the proposed project to support testing and indirect costs.

A. Key Personnel
Ghazi Kayali, Ph.D., Co-Investigator (1 week for OY1-2). Dr. Kayali will assist in conducting a three day didactic training on biosafety and security, including real-time PCR testing and analysis, influenza subtyping, genomic analysis of MER-CoVs and serology testing and analysis. For this he will be compensated one week salary, in addition to one week in OY2 to advise on data analysis, interpretation, and publications related to the laboratory work to promote scientific sharing of the laboratory methods to enhance detection capacity, for which we are requesting a total of $7,700.

B. Other Personnel
No funds are requested for other personnel costs.

C. Equipment
No funds are requested for equipment costs.

D. Travel
In order to conduct the biosafety, security and laboratory technique training in OY1, we are requesting $2,387 in international travel to cover the flight from Cairo to Amman (estimated at $400) as well as the federal per diem rates of $246 for lodging in Amman, Jordan and $138 for meals in Amman, Jordan.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Laboratory Testing
The Human Link lab at the National Research Centre in Egypt will be utilized to test human for MERS-CoV antibodies, supervised by Co-I Kayali. This will be conducted using a pseudoparticle neutralization (ppNT) assay where the spike protein of MERS-CoV is expressed by a replication-incompetent human immunodeficiency virus (HIV) thus avoiding the use of live MERS-CoV in the assay. Sera will be screened at a dilution of 1:10 and positive sera will be tested for end-point titers. Additionally, three Jordanian scientists and three students will also be trained in laboratory techniques at the Human Link laboratory in Egypt during the course of the project. The testing costs $40 per test, for a total of $14,256 p.a in Y1, Y3 and OY1.

H. Indirect Costs
We are requesting the federally agreed indirect cost of 8% on all direct costs.

BUDGET JUSTIFICATION FOR JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, JORDAN

The Jordan University of Science and Technology (JUST) requests a total of $2,399,786 over all years of the proposed project to support personnel, travel, equipment, other direct costs and indirect costs.

A. Key Personnel

Ehab Abu-Basha, Ph.D., Co-Investigator (12.0 calendar month for all years). Dr. Abu-Basha will provide overall project oversight for Jordan-based activities. Dr. Abu-Basha will be leading all elements on the human and animal subjects research side of the project as well as the laboratory diagnostics elements. Dr. Abu-Basha will ensure JUST meets project tasks and milestones, will oversee JUST's budget, and will assist with dissemination of findings through publications and conference presentations. We request $128,400 p.a. in salary for Dr. Abu-Basha.

Hani Talafha, M.S., Biologist (8.0 calendar month for all years). As Director of Research Services at JUST, Mr. Talafha will co-oversee field work and assist in Jordan staff management, for which $32,000 is requested p.a.

Zaidoun Hijazeen, M.S, Veterinarian (2.0 calendar month for Y1, 12.0 calendar month Y2-OY2) Dr. Hijazeen will co-oversee field work, assist in study design and train and manage Jordan staff for which $8,000 is requested starting in Y1.

Mustafa Ababneh, Ph.D., Virologist (2.5 calendar month for Y1-OY2). As Lab Director, Dr. Ababneh will provide oversight of laboratory staff and activities, conduct laboratory analyses, provide interpretation of test results, supervise and train students, for which $15,000 is requested p.a.

Zuhair Bani Ismail, B.S., Livestock Expert (2.5 calendar month for Y1-OY2). Mr. Ismail will be responsible for the livestock sampling compliance and interpretation of test results for which $12,500 is requested p.a.

Borhan Al-Zoghoul, Ph.D., Molecular Biologist (3.0 calendar month for Y1-OY2). As Lab Director, Dr. Al-Zoghoul will provide oversight of laboratory staff and activities, conduct laboratory analyses, provide interpretation of test results, supervise and train students, for which $15,000 is requested p.a.

Bilal Al-Omari, BSc, Lab Supervisor (3.0 calendar month for Y1-OY2). As Lab Supervisor, Mr. Al-Omari will conduct laboratory analyses, provide interpretation of test results, supervise and train students for which $9,000 is requested p.a.

Wail Hayajneh, MBBS, Human Idntification Expert (1.0 calendar month for Y1-OY2). Mr. Hayajneh will assist with study design for the human components of the study and serve as government liaison, for which $5,000 is requested p.a.

B. Other Personnel

Saad Gharaibeh, Ph.D., Avian Pathologist (1.0 calendar month for Y1-3, 2.0 calendar months for OY1-OY2). Dr. Gharaibeh will assist with study design and implementation for the poultry components, provide interpretation of test results, and provide guidance on recommendations for which $5,000 is requested starting in Y1.

Administrative Assistant (3.5 calendar months for Y1-OY2). The administrative assistant will be handling project management responsibilities related to expenses, managing of the subcontract, scheduling and logistics, for which we request S6,300 p.a.

Nurses (2.0 calendar months for Y1, 4.0 calendar months for Y2-3, 3.0 calendar months for OY1). Two Jordanian nurses will be responsible for assisting with the human sampling at the field study sites. We request $78,800 over the proposed five years of the project for these two positions.

C. Equipment

A field vehicle for field sampling and sample transport is estimated at S35,000. The current agreement with DTRA and the US Embassy in Jordan will allow the vehicle to be imported without having to pay VAT.

D. Travel

Domestic Travel

In order to conduct field sampling, teams of five, including two nurses, will be visiting five sites (Al Ramtha, Al Zarqa, Al Karak, Ma'an, Aqaba) for five days each twice in Y1, four times in Y2-Y3 and three times in OY1. Field staff will be provided with a per diem for food and lodging of $60 per person per day. In order to cover meals, lodging, fuel for both field work and meetings around Irbid and Amman (an estimated 30,000 km Y1-OY1 and 10,000 miles in OY2), vehicle maintenance and refreshments for those participating in human work we request S22,330 in Y1.

International Travel

We are requesting travel for Jordanian project participants to attend aa average of five regional conferences and five international conferences each year to present on project findings. For the regional conference flights are estimated at $600 and hotels and meals at the government GSA per diem rates for Istanbul, Turkey of $299 and S131, respectively. For the international conference flights are estimated at S800 and hotels and meals at the government GSA per diem rates for Vienna, Austria of S221 and $122, respectively. We are requesting travel for Dr. Abu-Basha to the DTRA meeting in Northern Virginia, with the flight estimated at S1,000 and hotels and meals at the government GSA per diem rates of S251 and S76. For the MERS Serology, a neutralization test will be performed in Cairo. The samples will be hand carried once in Y1, Y3 and OY1 and accompanied by three project staff and three students for training in the lab in Cairo. For this travel, flights estimated at $400 and hotels and meals at the government GSA per diem rates for Cairo, Egypt of S175 for lodging and S98 for meals and incidentals for a seven day trip. We are requesting S3,000 p.a. to cover conference fees along with $500 p.a. for visa fees. For each trip, RT taxi to the airport are estimated at $75 along with $25 per day for in-country taxis.

In total over the course of the project, we are requesting $162,302 in for International Travel.

E. Participant/Trainee Support Costs
No funds are requested for participant or trainee support costs.

F. Other Direct Costs
Materials and Supplies
We will supply the field team with all consumables required to collect samples, including serum tubes, vacutainer holder, needles, syringes, nitrile gloves, cotton swabs, Tyvek suits, goggles, biohazard bags, and sharps containers as well as five tablets ($200 ea.) for data collection at field sites. To ensure cold chain, for field visits outside Amman dry ice is required at a cost of $150 per week. We request $71,866 over all years of the project for field supplies.

Laboratory Testing
Our laboratory cost request covers PCR for MERS-CoV and avian influenza as well as serology for MERS-CoV, avian influenza, brucellosis and leptospirosis. Pricing is based on in-house costs on a per test basis. Details on numbers of each test and unit price are provided here for each year that laboratory testing will be conducted, Year 1 Option Year 1.

TESTS	YEAR 1		
	Number of tests	Price/test	Total
MERS PCR Humans	600	$ 15.00	$ 9,000.00
MERS PCR camels	200	$ 15.00	$ 3,000.00
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
AI PCR Humans	600	$ 15.00	$ 9,000.00
AI PCR poultry	200	$ 15.00	$ 3,000.00
AI PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00
AI serology humans	300	$ 6.00	$ 1,800.00
AI serology poultry	100	$ 6.00	$ 600.00
AI serology Subtype Tesing	100	$ 15.00	$ 1,500.00
Brucella serology humans	300	$ 1.00	$ 300.00
Brucella serology camels	100	$ 1.00	$ 100.00
Brucella serology other ruminants	100	$ 1.00	$ 100.00
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00
Lepto serology humans	400	$ 8.00	$ 3,200.00
Lepto serology camels	100	$ 8.00	$ 800.00
Lepto serology other ruminants	100	$ 8.00	$ 800.00
Lepto Serovar Test	60	$ 10.00	$ 600.00
			$ -
		YI Total	$ 40,300.00

TESTS	YEAR 2		
	Number of tests	Price/test	Total
MERS PCR Humans	1200	$ 15.00	$ 18,000.00
MERS PCR camels	400	$ 15.00	$ 6,000.00
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
AI PCR Humans	1200	$ 15.00	$ 18,000.00
AI PCR poultry	400	$ 15.00	$ 6,000.00
AI PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
MERS Serology camels ELIZA	0	$ 15.00	$ -
AI serology humans	0	$ 6.00	$ -
AI serology poultry	0	$ 6.00	$ -
AI serology Subtype Tesing	100	$ 15.00	$ 1,500.00
Brucella serology humans	0	$ 1.00	$ -
Brucella serology camels	0	$ 1.00	$ -
Brucella serology other ruminants	0	$ 1.00	$ -
Brucella Complement Fixation Test	0	$ 10.00	$ -
Lepto serology humans	0	$ 8.00	$ -
Lepto serology camels	0	$ 8.00	$ -
Lepto serology other ruminants	0	$ 8.00	$ -
Lepto Serovar Test	0	$ 10.00	$ -
		Y2 Total	$ 53,500.00

TESTS	YEAR 3		
	Number of tests	Price/test	Total
MERS PCR Humans	1200	$ 15.00	$ 18,000.00
MERS PCR camels	400	$ 15.00	$ 6,000.00
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
AI PCR Humans	1200	$ 15.00	$ 18,000.00
AI PCR poultry	400	$ 15.00	$ 6,000.00
AI PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00
AI serology humans	300	$ 6.00	$ 1,800.00
AI serology poultry	100	$ 6.00	$ 600.00
AI serology Subtype Tesing	100	$ 15.00	$ 1,500.00
Brucella serology humans	300	$ 1.00	$ 300.00
Brucella serology camels	100	$ 1.00	$ 100.00
Brucella serology other ruminants	100	$ 1.00	$ 100.00
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00
Lepto serology humans	400	$ 8.00	$ 3,200.00
Lepto serology camels	100	$ 8.00	$ 800.00
Lepto serology other ruminants	100	$ 8.00	$ 800.00
Lepto Serovar Test	60	$ 10.00	$ 600.00
		Y3 Total	$ 64,300.00

TESTS	OPTION YEAR 1		
	Number of tests	Price/test	Total
MERS PCR Humans	900	$ 15.00	$ 13,500.00
MERS PCR camels	300	$ 15.00	$ 4,500.00
MERS PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
AI PCR Humans	900	$ 15.00	$ 13,500.00
AI PCR poultry	300	$ 15.00	$ 4,500.00
AI PCR Sequencing of positives	20	$ 100.00	$ 2,000.00
MERS Serology camels ELIZA	100	$ 15.00	$ 1,500.00
AI serology humans	300	$ 6.00	$ 1,800.00
AI serology poultry	100	$ 6.00	$ 600.00
AI serology Subtype Tesing	100	$ 15.00	$ 1,500.00
Brucella serology humans	300	$ 1.00	$ 300.00
Brucella serology camels	100	$ 1.00	$ 100.00
Brucella serology other ruminants	100	$ 1.00	$ 100.00
Brucella Complement Fixation Test	100	$ 10.00	$ 1,000.00
Lepto serology humans	400	$ 8.00	$ 3,200.00
Lepto serology camels	100	$ 8.00	$ 800.00
Lepto serology other ruminants	100	$ 8.00	$ 800.00
Lepto Serovar Test	60	$ 10.00	$ 600.00
		OYI Total	$ 52,300.00

Meetings and Conferences

We request support for an annual meeting each year for 45 people including personnel from partner institutions (EHA and JUST) as well as local stakeholders. Travel costs for United States-based participants to attend the annual meeting are covered in the EcoHealth Alliance budget. We estimate that for the one-day meeting, ten Jordanian partners traveling from outside Amman will require transportation (estimated at S60 per person), meals and accommodation to be covered (S246 for lodging and $138 for meals and incidentals). Lunch will be provided for all participants and there will be costs associated with room rental (S1,000 per day), translation and sound equipment to facilitate translation ($2,000 per day) and printing and supplies. Overall costs for the annual meetings are estimated at $12,605 p.a.

In addition to the annual meeting, there will be a Kick Off meeting in Y1 only for 20 participants, five of which will be from outside of Amman. All cost estimates remain the same from the annual meeting, with the Kick Off Meeting estimated at $7,740.

There will be three regional meetings held in Amman in Y2, OY1 and OY2, for which regional transport will be required for two people each from Egypt (S200), Lebanon (S300) and Iraq

($500) as well as meals and accommodation to be covered (S246 for lodging and S138 for meals and incidentals). We will have the same printing, supplies, room rental and translation fees as above and lunch included for 24 participants. For the regional meetings, we request S19,865 each.

A threat reduction workshop in planned for OY2 with transportation and accommodation for ten participants from Jordan and international travel and accommodation for four participants each from Lebanon and Iraq; the workshop will consist of 45 total participants. The costs for flights, accommodation, meals and incidentals, lunch, room rental, and translation services remain the same as mentioned above. The printing and supplies is estimated for this meeting at S1,500 for the printing of booklets and reports. The total cost of this workshop is $45,743.

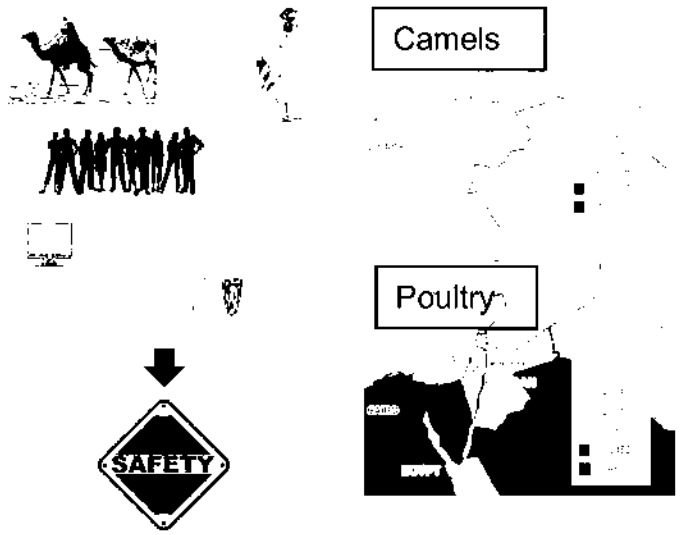
H. Indirect Costs

We are requesting the federally agreed indirect cost of 8% on all direct costs.

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan, PI: William B. Karesh, BTRP-TA.6 CC WMD GRANT # 12862917

Objective: Work with government and private sector partners to characterize causal factors in animal-to-human transmission of MERS, AI, and other zoonoses in Jordan, implement serological technology for enhanced diagnostic and detection capabilities, and strengthen regional detection and reporting capacity to reduce biological threats.

Method: Conduct a prospective cohort study at various human-livestock/poultry interfaces across Northern, Middle, and Southern Jordan. Conduct regional collaboration and capacity building workshops in Jordan for Iraqi and Lebanese scientists from Health, Agriculture, and related Ministries and agencies.



Status of effort: Collaborative team working on infectious diseases in humans and animals in place. Established relationships with Ministries, labs, university scientists, poultry industry, camel owners and Bedouin community.

Personnel Supported: 7 University Faculty, 6 Other Scientists, 2 Scientific Advisors, 20 professional students, >24 government workshop participants.

Publications & Meetings: 10 stakeholder/partner meetings and training workshops, 8 scientific publications, >40 conference presentations

Major Goals and Milestones:

- Determine evidence of MERS, AI, and other zoonoses in humans, livestock and poultry in Jordan (Y1-OY2)
- Identify risk factors and modifiable behaviors for threat reduction (Y1-OY2)
- Improve knowledge and diagnostic capacity (Y1-OY2)

Funding Profile Yr 1:$994,909, Yr 2:$993,790 Yr 3:$999,490, OYr 1: $999,995, OYr 2: $987,497

Contact information PI: Dr. William B. Karesh, 212-380-4463 Karesh@ecohealthalliance.org

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity/PI Karesh
Thrust Area 6 - CCWMD Research with Global Partners FRCWMD
Statement of Work

Project Title: Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity.

Document Date: 28 August 2019.

Objective: The objective of this grant is to reduce the threat of high-consequence zoonotic pathogens in Jordan and improve regional disease surveillance capacity. Jordan faces risk of several zoonoses of concern to human and animal health, including Middle East Respiratory Syndrome (MERS-CoV) and Avian Influenza (AI), with fundamental knowledge and capacity gaps around the distribution and determinants of zoonoses. Recent work by our team detected MERS-CoV in camels and people in Jordan, suggesting ongoing and unmitigated transmission risk of a priority pathogen. The proposed study will generate critical advances in determining the presence of zoonotic pathogens in the country and opportunities for public health intervention. Through a prospective human cohort study coordinated with animal sampling, we will conduct biological and behavioral surveillance in five regions of Jordan with livestock production interfaces to determine the presence and risk factors for MERS-CoV, AI, brucellosis, and leptospirosis to identify modifiable risk factors. By testing three core policy-relevant hypotheses and providing multi-disciplinary training opportunities, the awardee shall enhance scientific capacity in Jordan and support disease detection and reporting in Jordan, Iraq and Lebanon. Taking a coordinated, multi-hazard approach to threat reduction, the proposed study will add critical understanding of presence and risk factors for zoonotic diseases in Jordan and advance scientific capacity and application of the One Health concept to counter biothreats in the region.

Scope: The awardee proposes a five-year One Health study of zoonotic diseases in Jordan. The awardee team shall focus on the following major goals and milestones:

1) Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and poultry in Jordan: *Implement animal study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

2) Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses: *Implement human cohort study (Y1-OY1); Conduct PCR and serology testing (Y1-OY2)*

3) Characterize causal factors in animal-to-human transmission of these zoonoses: *Implement behavioral risk survey (Y1-OY1); Conduct epidemiological analyses (Y1-OY2)*

4) Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk: *Generate geospatial distribution and risk maps (Y1-OY2)*

5) Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon: *Host workshops (Y1-2, OY1-2); Submit reports and publications (Y1-OY2); Attend presentations/meetings (Y1-OY2)*

6) Identify specific modifiable risk factors for human infection with these zoonoses: *Conduct causal interference analyses (Y3-OY2); Policy recommendations on modifiable risk factors (Y3-OY2)*

This research will generate critical advances in detecting the presence of and exposure risk to high-consequence zoonotic viruses and bacteria across geographic regions and interfaces in Jordan, contributing to enhanced understanding of modifiable risk factors to inform government authorities on prevention activities to reduce disease threats.

Background: Jordan has experienced outbreaks of several high-consequence zoonotic diseases, including MERS-CoV and AI. Since its emergence in 2012, MERS-CoV has resulted in over 2,400 human cases globally and is recognized as a priority disease under the WHO R&D Blueprint. While the first human cases of MERS-CoV were traced back to Jordan, little is known about its underlying and ongoing risk of zoonotic disease in animal populations, particularly around primary transmission risk factors and pathways that precede spread in healthcare settings. MERS-CoV is one of several zoonoses posing threat to animal and human populations in the country. Highly Pathogenic Avian Influenza outbreaks, including subtype H5N1, have been reported, and brucellosis is considered endemic in Jordan, with recurring spillover but inadequate understanding of specific modes of transmission and poor vaccination coverage. While human cases of leptospirosis have not been reported in Jordan to date, high rates of certain Leptospira serovars have been detected in animals. Key questions and capacity gaps hinder understanding of the presence, distribution and risk factors in the country, leaving the country vulnerable to zoonotic biothreats, as well as wider regional gaps in detection and reporting. The threat of zoonotic disease is especially pertinent given the rapidly-growing poultry production industry in Jordan and camel, livestock, and poultry rearing in the region.

Jordan has recently made recent several notable scientific advances in detection of MERS-CoV, generating preliminary data that the proposed project will build on. While camels are the presumptive source of primary human MERS-CoV infections, the exact mechanisms of transmission and the possible role of other livestock species are unclear. Blood samples collected from camels and humans in the northern region of Jordan were positive for MERS-CoV, leading to the first-ever report of this disease to OIE in camels in Jordan in 2016. To date, only few countries have reported virus-positive MERS-CoV test results to the OIE so this is a significant and important step toward improving both MERS-CoV detection and reporting in the Middle East. Studies of zoonotic pathogens in the region to date have largely focused on single sites or interfaces, cross-sectional sampling events, or select taxonomic groups, limiting understanding of causal factors. Research is needed to monitor presence and transmission of zoonotic pathogens spatially, temporally, and by biohazard exposure (e.g. blood, urine, feces, and/or nasal secretions) and practices and conduct epidemiological analyses to identify modifiable risk factors for public health intervention. As a key area of stability in the region, it is crucial to support Jordan's biosurveillance capacity, enable understanding of baseline disease risk to allow differentiation of natural versus nefarious emergence events, and ensure responsible bio-risk management to ethically monitor and reduce disease threats. The country has also recently established a One Health platform that indicates the country's commitment to countering zoonotic disease threats. Given the volume of migration between Jordan and its neighbors, including in animal trade, regional coordination in disease monitoring and threat reduction is a critical component in effectively characterizing and addressing disease risk. This project seeks to fill current capacity gaps to advance Jordan as a leader in scientific research and zoonotic disease management and creating new capacity and scientific collaboration pathways for hypothesis-driven research and zoonotic disease monitoring and threat reduction in the region.

Key references include (additional references can be found in the Project Narrative):

van Doremalen N, Hijazeen ZS, Holloway P, Al Omari B, McDowell C, Adney D, Talafha HA, Guitian J, Steel J, Amarin N, Tibbo M, Abu-Basha E, Al-Majali AM, Munster VJ, Richt JA. High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan. *Vector Borne Zoonotic Dis*. 2017 Feb;17(2):155-159.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, Burbelo PD, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB, Lipkin WI. Middle East respiratory syndrome coronavirus infection in dromedary camels in Saudi Arabia. *MBio*. 2014 Feb 25;5(2):e00884-14.

World Health Organization. Joint External Evaluation of IHR Core Capacities of the Hashemite Kingdom of Jordan. Geneva. 2016.

Tasks/Scientific Goals: **(Format: Year #(s). Task #. Subtask#).**

TASK 1: Y1.1-O2.1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan.

The awardee shall study presence of MERS-CoV, AI, Brucellosis and Leptospirosis in animals. Sites will be selected in five geographically-representative regions across Jordan: Northern Jordan (Al Ramtha), Middle Jordan (Al Zarqa), and Southern Jordan (Al Karak, Ma'an, and Aqaba). These regions were selected based on preliminary findings by our team and the presence of livestock production activities. Sites in each region shall reflect interfaces with poultry, camels, and other livestock animals are represented (e.g. farms or markets). The awardee shall receive permissions and approvals to work with animals prior to initiating sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 camels, poultry and other livestock quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Y1, Y3, and OY1 during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 animals. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, Brucellosis, and Leptospirosis. Staff training on proper study techniques (e.g. sampling, transport, and laboratory) will occur as detailed in Task 5. This task will contribute to testing the hypothesis that livestock species and poultry in Jordan show evidence of infection with MERS-CoV, AI, and/or other assayed zoonoses, as well as inform type of transmission pathways.

Y1.2.1 Identify sites for project study.

Y1.2.2 Obtain local permissions and approvals to work with animals.

Y1.2.3-O1.2.3 Conduct biological sampling in animals within the study area.

Y1.2.4-O2.2.4 Conduct PCR and/or serology testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 2: Y1.2- OY2.1: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection with these zoonoses.

The awardee shall conduct a prospective cohort study of humans to evaluate behavioral and occupational risk factors for zoonotic infectious diseases (MERS-CoV, avian influenza, brucellosis, and leptospirosis) among persons living in Jordan in any of the five study regions. The study will enroll persons regularly working with livestock or poultry or sharing their living areas with these animals as well as persons unexposed to these factors. Sites will be selected as in Task 1 and in surrounding communities to enroll both exposed and unexposed populations. In Year 1, the awardee will receive local permissions and approvals to work with human subjects prior to initiating enrollment and sampling. Nasopharyngeal and oropharyngeal swabs will be collected from 300 enrolled humans quarterly in Year 1, Q3 through Option Year 1, Q3 (a total of 13 sampling visits). At three points during the project (in Year 1, Year 3, and Option Year 1

during the 1st, 7th, and 13th sampling visits, respectively), blood samples (serum) will be collected from 300 humans. Nasopharyngeal and oropharyngeal swabs will be tested for MERS-CoV and AI using real time PCR. Serum samples will be tested using serology for MERS-CoV, AI, brucellosis, and leptospirosis (Years 1-4). Biological sampling will be paired with behavioral surveillance data as in Task 3.

Y1.2.1 Identify sites and conduct enrollment for human study component.

Y1.2.2 Obtain local permissions and approvals to work with human subjects.

Y1.2.3-O1.2.3 Conduct biological sampling (nasopharyngeal and oropharyngeal swabs, and/or blood) of in people within the study area.

Y1.2.4-O2.2.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis.

TASK 3: Y1.3-OY2.3: Characterize causal factors in animal-to-human transmission of these zoonoses.

The awardee shall monitor behaviors of persons enrolled in the prospective cohort study (as in Task 2) to identify and characterize causal factors for animal-to-human transmission of MERS-CoV, AI, brucellosis and leptospirosis. The PREDICT-2 Human Behavioral Risk Questionnaire will be augmented with animal-specific exposure frequency questions to collect demographic data, symptom and medical history data, social history data, and specific animal-related behaviors and practices that are possible risk factors for infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. The project team will administer the survey to enrolled participants at the first sampling visit (Year 1). During all future visits (Year 1- Option Year 1), enrolled participants will be administered a brief follow-up questionnaire designed primarily to capture time-varying exposure and covariate data. This longitudinal information will provide critical information about the context of exposures and pathways to link biological sampling and provide the wider context of practices and risk factors. Epidemiologic analysis of the questionnaire data (including time-varying data) in this Task will identify current practices and exposure pathways and initial modifiable risk factors. Specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) will be assessed under Task 6 for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis, or leptospirosis. Results will be shared via annual reports and stakeholder meetings as in Task 5.

Y1.3.1 Obtain local permissions and approvals to work with human subjects.

Y1.3.2-O1.3.2 Conduct behavioral risk factor surveys in people.

Y1.3.3-O2.3.3 Analyze epidemiologic causal inference to identify modifiable risk factors.

TASK 4: Y1.4-OY2.4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk.

The awardee shall map findings from Tasks 1-2 to show the distribution of detected pathogens across the regions and sampling sites. Geospatial mapping is a highly relevant visual tool to assist authorities in targeting surveillance and risk management activities. Using QGIS, laboratory results of human and animal testing for MERS-CoV, avian influenza, brucellosis, and leptospirosis will be populated and mapped to show the distribution of detected pathogens. Maps will be generated beginning Y1, Q3 when laboratory findings are available. Geospatial risk maps will be generated using statistical models to link human behavioral data to laboratory findings beginning in Y1, Q4. Geospatial maps will be updated quarterly and shared with USG/DTRA and Jordanian project partners. Training on geospatial analysis will be provided to project team

members and will be covered under a regional workshop to promote broader uptake of geospatial mapping as a low-cost tool to enhance disease monitoring programs in the region (Task 5).

Y1.4.1-O2.4.1 Generate maps of laboratory results

Y2.4.2-O2.4.2 Generate risk maps of human behavioral risk data

TASK 5: Y1.5-OY2.5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon through meetings and workshops.

Strengthening disease detection and reporting capacity is a key contributor to health security and the ability to target risk factors for threat reduction. The project team is committed to improving this capacity in Jordan as well as more widely in the region through involvement of scientists and government officials in Iraq and Lebanon. We will train local staff in proper techniques for all project activities (Year 1 and Option Year 1). Each year we will support four students from medical and veterinary disciplines in Jordan to participate in training, field activities, project analyses and workshops to provide scientific mentorship and promote the One Health concept. Jordanian scientists and students will also be trained in laboratory techniques at the Human Link laboratory in Egypt during the course of the project. The awardee shall organize workshops in Jordan open to scientists from the Ministries of Health and Agriculture from Jordan, Iraq, and Lebanon (Years 1-2, Option Years 1-2). A secure project database will be developed for use in the epidemiological analyses. The awardee shall provide submission of annual sample repository information using a DTRA-specified format and shall grant access to all samples collected and data generated during the course of the project, up to and including at least 12 months after the project end date. The awardee shall conduct presentations/meetings at times and places specified in the grant schedule (Year 1 Task 5), including the DTRA Annual Technical Review. In Year 1 the awardee shall hold a kick-off meeting to introduce the project objectives and promote buy-in in study findings and capacity sustainment. Annual reports and stakeholder meetings and scientific presentations and publications will be used to disseminate results. The project will reinforce Jordan's national One Health platform, promoting the One Health concept for multiple diseases of concern for public and animal health and advancing capacity for hypothesis-driven research with direct application for policy decisions for threat reduction.

Y1.5.1 Conduct project kick-off meeting in Amman with local stakeholders.

Y1.5.2 & O1.5.2 Train local project staff in proper techniques.

Y1.5.3-O2.5.3 Host annual partners and stakeholders meeting.

Y1.5.4-O2.5.4 Complete annual report and share with project partners and local stakeholders.

Y1.5.5-Y2.5.5 & O1.5.5-O2.5.5 Conduct local/regional training workshops.

Y1.5.6- O2.5.6 Data management.

Y1.5.7- O2.5.7 Conduct presentations/meetings at times and places specified in the grant schedule, including DTRA Annual Technical Review.

TASK 6: Y3.6-OY2.6: Identify specific modifiable risk factors for human infection with these zoonoses.

The awardee shall integrate the findings of the biological testing (animal and human) and behavioral surveys in Tasks 1-3, assessing specific animal-related behaviors and practices that involve exposure to specific animal biohazards (e.g., blood, urine, feces, and/or nasal secretions) for whether they pose a greater risk of infection with MERS-CoV, avian influenza, brucellosis,

or leptospirosis. These potential modifiable risk factors will be determined through epidemiologic analysis of the questionnaire data (including time-varying data) paired with individual laboratory results (e.g., detection of viral RNA, bacterial DNA, or antibodies). Using quarterly, longitudinal data collected in Tasks 1-3, we will examine any major temporal dynamics that may be associated with elevated transmission risk (e.g. seasonality, animal birthing periods). Causal inference techniques within the potential outcomes framework will be employed to solidify statistical associations as concretized biological/clinical/environmental pathways by operationalizing exposures as well-defined interventions and ensuring exchangeability is maintained through confounder control informed by directed acyclic graphs of the conceptual exposure-disease pathways. The awardee will examine multiple zoonotic pathogens (as above) to inform general threat reduction guidelines. Identification of modifiable risk factors will inform intervention development that may interrupt future zoonotic transmission of the four pathogens in this study. Findings will be shared with USG/DTRA and the Jordanian Ministry partners at the annual stakeholders meetings, the threat reduction workshop, scientific presentations and publications as specified in Task 5. This information will provide a strong basis for potential policy guidance and the generation of solutions at the threat reduction workshop in OY2.

Y3.6.1-O2.6.1 Conduct causal inference analyses bases on Tasks 1, 2, 3.

Y3.6.2-O2.6.2 Share results of analyses at annual partners and stakeholders meeting.

Y3.6.3 & O2.6.3 Submit written report to DTRA and local partners and stakeholders.

Performance Schedule:

Task	Year 1	Year 2	Year 3	OY 1	OY 2
Task 1: Determine the presence of MERS-CoV, AI, and other zoonoses among livestock and/or poultry in Jordan					
1.1. Identify sites for project study					
1.2 Obtain local permissions and approvals to work with animals					
1.3 Conduct biological sampling in animals within the study area					
1.4 Conduct lab testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 2: Determine whether (and if so, the extent to which) humans at human-livestock/poultry interfaces display evidence of infection					
2.1 Identify sites and conduct enrollment for human study component					
2.2 Obtain local permissions and approvals to work with human subjects					
2.3 Conduct biological sampling					
2.4 Conduct testing for AI, MERS-CoV, brucellosis and leptospirosis					
Task 3: Characterize causal factors in animal-to-human transmission of these zoonoses					
3.1 Obtain local permissions and approvals to work with human subjects					
3.2 Conduct behavioral risk factor surveys in people					
3.3 Analyze epi causal inference to identify modifiable risk factors					
Task 4: Produce geospatial maps of zoonoses in livestock and poultry and of human zoonotic transmission risk					
4.1 Generate maps of laboratory results					
4.2 Generate risk maps with human beh. risk data					
Task 5: Strengthen local capacity for detection and reporting of MERS-CoV, AI, and other zoonoses in Jordan, Iraq, and Lebanon					
5.1 Conduct project kick-off meeting in Amman with local stakeholders					
5.2 Train local project staff in proper techniques					
5.3 Host annual partners and stakeholders meeting					
5.4 Complete annual report and share with partners and stakeholders					
5.5 Conduct local/regional training workshops					
5.6 Data management					
5.7 Conduct presentations/meetings at times and places specified					
Task 6: Identify specific modifiable risk factors for human infection with these zoonoses					
6.1 Conduct causal inference analyses based on Task 1, 2, 3					
6.2 Share results of analyses at annual partners and stakeholders meeting					
6.3 Submit written report to DTRA and local partners and stakeholders					

OMB Number: 4040-0001
Expiration Date: 10/31/2019

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. TYPE OF SUBMISSION
☐ Pre-application ☒ Application ☐ Changed/Corrected Application

2. DATE SUBMITTED | **Applicant Identifier**

4. a. Federal Identifier
b. Agency Routing Identifier GRANT12862917
c. Previous Grants.gov Tracking ID

5. APPLICANT INFORMATION
Organizational DUNS: 077090660000
Legal Name: EcoHealth Alliance
Department: | Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York | County / Parish:
State: NY: New York | Province:
Country: USA: UNITED STATES | ZIP / Postal Code: 10001-2320

Person to be contacted on matters involving this application
Prefix: Dr. | First Name: William | Middle Name:
Last Name: Karesh | Suffix:
Position/Title: Executive Vice President of Health and Policy
Street1: 460 W 34th St
Street2: 17th Floor
City: New York | County / Parish:
State: NY: New York | Province:
Country: USA: UNITED STATES | ZIP / Postal Code: 10001 2320
Phone Number: 212-380-4463 | Fax Number: 212-380-4465
Email: karesh@ecohealthalliance.org

6. EMPLOYER IDENTIFICATION *(EIN) or (TIN)*: 311726494

7. TYPE OF APPLICANT: M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)
Other (Specify):
Small Business Organization Type ☐ Women Owned ☐ Socially and Economically Disadvantaged

8. TYPE OF APPLICATION:
☒ New ☐ Resubmission
☐ Renewal ☐ Continuation ☐ Revision

If Revision, mark appropriate box(es).
☐ A. Increase Award ☐ B. Decrease Award ☐ C. Increase Duration ☐ D. Decrease Duration
☐ E. Other (specify):

Is this application being submitted to other agencies? Yes ☐ No ☒ What other Agencies?

9. NAME OF FEDERAL AGENCY: Defense Threat Reduction Agency

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 12.351
TITLE: Scientific Research: Combating Weapons of Mass Destruction

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity

12. PROPOSED PROJECT:
Start Date: 01/01/2020 | Ending Date: 12/31/2024

13. CONGRESSIONAL DISTRICT OF APPLICANT
NY-010

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. First Name: William Middle Name:
Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy
Organization Name: Ecohealth Alliance
Department: Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4463 Fax Number:
Email: karesh@ecohealthalliance.org

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested	4,975,681.29
b. Total Non-Federal Funds	0.00
c. Total Federal & Non-Federal Funds	4,975,681.29
d. Estimated Program Income	0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:
DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR
☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious. or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ **I agree**

**The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.*

18. SFLLL (Disclosure of Lobbying Activities) or other Explanatory Documentation

Add Attachment

19. Authorized Representative

Prefix: Dr. First Name: Aleksei Middle Name:
Last Name: Chmura Suffix:
Position/Title: Authorized Organizational Representative
Organization: Ecohealth Alliance
Department: Division:
Street1: 460 W 34 St
Street2: 17th Floor
City: New York County / Parish:
State: NY: New York Province:
Country: USA: UNITED STATES ZIP / Postal Code: 10001-2320
Phone Number: 212-380-4473 Fax Number:
Email: chmura@ecohealthalliance.org

Signature of Authorized Representative: Aleksei Chmura

Date Signed: 08/28/2019

20. Pre-application Add Attachment

21. Cover Letter Attachment 1238-DTRA Jordan Cover Letter FINAL.pdf Delete Attachment View Attachment

RESEARCH & RELATED Other Project Information

OMB Number: 4040-0001
Expiration Date: 10/31/2019

1. Are Human Subjects Involved? ☒ Yes ☐ No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? ☐ Yes ☒ No

If yes, check appropriate exemption number. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

If no, is the IRB review Pending? ☐ Yes ☒ No

IRB Approval Date: 03/09/2020

Human Subject Assurance Number:

2. Are Vertebrate Animals Used? ☒ Yes ☐ No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? ☐ Yes ☒ No

IACUC Approval Date: 03/09/2020

Animal Welfare Assurance Number: A4059

3. Is proprietary/privileged information included in the application? ☐ Yes ☒ No

4.a. Does this Project Have an Actual or Potential Impact - positive or negative - on the environment? ☐ Yes ☒ No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? ☐ Yes ☐ No

4.d. If yes, please explain:

5. Is the research performance site designated, or eligible to be designated, as a historic place? ☐ Yes ☒ No

5.a. If yes, please explain:

6. Does this project involve activities outside of the United States or partnerships with international collaborators? ☒ Yes ☐ No

6.a. If yes, identify countries: Jordan, Egypt

6.b. Optional Explanation:

7. Project Summary/Abstract 1239-Project Summary_FINAL.pdf | Delete Attachment | View Attachment

8. Project Narrative 1240-DTRA Jordan Project Narrative_FI | Delete Attachment | View Attachment

9. Bibliography & References Cited 1241-References_FINAL.pdf | Delete Attachment | View Attachment

10. Facilities & Other Resources 1242 Facilities Description_FINAL.pdf | Delete Attachment | View Attachment

11. Equipment | Add Attachment

12. Other Attachments Add Attachments

OMB Number: 4040-0001
Expiration Date: 10/31/2019

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator

Prefix: Dr. * First Name: William Middle Name:
* Last Name: Karesh Suffix:
Position/Title: Executive Vice President of Health and Policy Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34 St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 212 380 4463 Fax Number:
* E-Mail: karesh@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** PD/PI **Other Project Role Category:**

Degree Type: DVM
Degree Year: 1982

***Attach Biographical Sketch**	1243-Karesh_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1244-Karesh_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 1

Prefix: Ms. * First Name: Catherine Middle Name:
* Last Name: Machalaba Suffix:
Position/Title: Policy Advisor and Research Scientist Department:
Organization Name: EcoHealth Alliance Division:
* Street1: 460 W 34th St
Street2: 17th Floor
* City: New York County/ Parish:
* State: NY: New York Province:
* Country: USA: UNITED STATES * Zip / Postal Code: 10001-2320
* Phone Number: 212 380 4472 Fax Number:
* E-Mail: machalaba@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: MPH
Degree Year: 2009

Attach Biographical Sketch	1245-Machalaba_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1246-Machalaba_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 2

Prefix: Dr. * First Name: Ehab Middle Name:

* Last Name: Abu-Basha Suffix:

Position/Title: Country Coordinator Department:

Organization Name: USAID EPT PREDICT 2 Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: abubasha@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2002

Attach Biographical Sketch	1247-Abu-Basha_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1248-Abu-Basha_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 3

Prefix: Dr. * First Name: Ghazi Middle Name:

* Last Name: Kayali Suffix:

Position/Title: Chief Executive Officer Department:

Organization Name: Human Link Division:

* Street1: Said Freiha Street

Street2:

* City: Hazmieh County/ Parish:

* State: Province:

* Country: LBN: LEBANON * Zip / Postal Code:

* Phone Number: +961 5 45 42 52 Fax Number: +961 5 45 80 45

* E-Mail: ghazi@human-link.org

Credential, e.g., agency login:

*** Project Role:** Co Investigator **Other Project Role Category:**

Degree Type: PHD

Degree Year: 2008

Attach Biographical Sketch	1249 Kayali_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1250 Kayali_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 4

Prefix: Dr. * First Name: Patrick Middle Name:

* Last Name: Dawson Suffix:

Position/Title: Epidemic Intelligence Service Officer Department: Nat Ctr for Emerging & Zoonoti

Organization Name: Centers for Disease Control and Prevention Division: Div of High Consequence Pathog

* Street1: 1600 Clifton Road

Street2:

* City: Atlanta County/ Parish:

* State: GA: Georgia Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 30329-4027

* Phone Number: 848 888 2402 Fax Number:

* E-Mail: patrick.t.dawson@gmail.com

Credential, e.g., agency login:

*** Project Role:** Co-Investigator **Other Project Role Category:**

Degree Type: PhD

Degree Year: 2019

Attach Biographical Sketch	1251-Dawson_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1252-Dawson_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 5

Prefix: Ms. * First Name: Emily Middle Name:

* Last Name: Hagan Suffix:

Position/Title: Behavioral Risk Prograr Manager Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001 2320

* Phone Number: 212-380-4491 Fax Number:

* E-Mail: hagan@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Behavioral Risk Scientist

Degree Type: MPH

Degree Year: 2013

Attach Biographical Sketch	1253 Hagan_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1254 Hagan_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 6

Prefix: Dr. * First Name: Mustafa Middle Name:

* Last Name: Ababneh Suffix:

Position/Title: Faculty Department: Dept of Basic Medical Science

Organization Name: Jordan University of Science & Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: ababnem@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Virologist

Degree Type: PhD

Degree Year: 2005

Attach Biographical Sketch	1255-Ababneh_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1256-Ababneh_C&P .pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 7

Prefix: Dr. * First Name: Mch'd Borhan Middle Name:

* Last Name: Al Zghoul Suffix:

Position/Title: Vice Dean Department: Dept. Basic Medical Vet Sci

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: alzghoul@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Molecular Biologist

Degree Type: PHD

Degree Year: 2003

Attach Biographical Sketch	1257 Al Zghoul_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1258 Al Zghoul_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 8

Prefix: Mr. * First Name: Ilani Middle Name:

* Last Name: Talafha Suffix:

Position/Title: Director of Research Services Department:

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: hanit@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Biologist

Degree Type: MS

Degree Year: 2006

Attach Biographical Sketch	1259-Talafha_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1260-Talafha_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 9

Prefix: Mr. * First Name: Zaidoun Middle Name:

* Last Name: Hijazeen Suffix:

Position/Title: National Consultant Department:

Organization Name: Food and Agriculture Organization Division:

* Street1: Al-Sha'b St

Street2:

* City: Amman County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +96265562554 Fax Number:

* E-Mail: zaidoun.hijazeen@fao.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Veterinarian

Degree Type: MS

Degree Year: 2012

Attach Biographical Sketch	1261 Hijazeen_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1262 Hijazeen_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 10

Prefix: Dr. * First Name: Wail Middle Name:

* Last Name: Hayajneh Suffix:

Position/Title: Chairman Department: Infectious Diseases Committee

Organization Name: Jordan Food and Drug Administration Division:

* Street1: 11181

Street2:

* City: Amman County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +9626562000 Fax Number:

* E-Mail: wialh@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Human Infectious Diseases Expert

Degree Type: MBBS

Degree Year: 1991

Attach Biographical Sketch	1263-Hayajneh_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1264-Hayajneh_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 11

Prefix: Mr. * First Name: Zuhair Middle Name:

* Last Name: Bani Israil Suffix:

Position/Title: Professor Department: Dept. of Clinical Vet Med Sci

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +96202720100 Fax Number:

* E-Mail: zuhair72@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Livestock Infectious Disease Expert

Degree Type: BS

Degree Year: 1995

Attach Biographical Sketch	1265 Israil_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1266 Israil_C&P.pdf		Delete Attachment	View Attachment

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Senior/Key Person 12

Prefix: Mr. * First Name: Bilal Middle Name:

* Last Name: Al-Omari Suffix:

Position/Title: Supervisor of the Diagnostic Laboratory, Department: Veterinary Health Center

Organization Name: Jordan University of Science and Technology Division:

* Street1: 22110

Street2:

* City: Irbid County/ Parish:

* State: Province:

* Country: JOR: JORDAN * Zip / Postal Code:

* Phone Number: +962027201000 Fax Number:

* E-Mail: bilal@just.edu.jo

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Laboratory Supervisor

Degree Type: BSc

Degree Year: 1990

Attach Biographical Sketch	1267-Al Omari_Biosketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1268-Al-Omari_C&P.pdf		Delete Attachment	View Attachment

PROFILE - Senior/Key Person 13

Prefix: Dr. * First Name: Whitney Middle Name:

* Last Name: Bagge Suffix:

Position/Title: Disease Ecologist Department:

Organization Name: EcoHealth Alliance Division:

* Street1: 460 W 34th St

Street2: 17th Floor

* City: New York County/ Parish:

* State: NY: New York Province:

* Country: USA: UNITED STATES * Zip / Postal Code: 10001 2320

* Phone Number: 212-380-4468 Fax Number:

* E-Mail: bagge@ecohealthalliance.org

Credential, e.g., agency login:

*** Project Role:** Other (Specify) **Other Project Role Category:** Modeler

Degree Type: PhD

Degree Year: 2017

Attach Biographical Sketch	1269 Bagge_BioSketch.pdf		Delete Attachment	View Attachment
Attach Current & Pending Support	1270 Bagge_C&P.pdf		Delete Attachment	View Attachment

William B. Karesh
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: karesh@ecohealthalliance.org

Professional Preparation

Clemson University	Biology	BS	1977
Univ. of Georgia	Veterinary Medicine	DVM	1982
Zool. Society of San Diego	Residency – Wildlife Health		1982 - 1984

Appointments

Life Member, Council on Foreign Relations	2016 - present
Emerging Pandemic Threats Partner Liaison, USAID EPT PREDICT-2	2014 - present
Advisor, WHO Expert Panel on MERS-CoV	2013 - present
Expert, WHO International Health Regulation Roster of Experts	2013 - present
Executive Vice President for Health & Policy, EcoHealth Alliance	2010 - present
President, Working Group on Wildlife Diseases, OIE, France	2008 - present
Co-Chair, Wildlife Health Specialist Group, IUCN, Switzerland	2001 - present
Chief Technical Officer, USAID EPT PREDICT	2009 - 2014
Chief of Party, USAID Global Avian Influenza Network for Surveillance	2006 - 2009
Vice President & Director, Global Health Programs, Wildlife Cons. Society	2001 - 2010

Publications

Kandeil A, Gomaa M, Shehata M, El Taweel AN, Mahmoud SH, Bagato O, Moatasim Y, Kutkat O, Kayed AS, *Dawson P*, Oui X, Bahl J, Webby RJ, Karesh WB, *Kayali G*. (2019) Isolation and characterization of a distinct influenza A virus from Egyptian bats. **Journal of Virology** 93(2).

Anthony SJ, Johnson CK, Grieg D, Kramer S, Che X, Wells HL, Hicks AL, Joly D, Wolfe ND, Daszak P, Karesh WB, Lipkin WI, Morse SS, Predict Consortium, Mazet J, Goldstein T. (2019) Global patterns in coronavirus diversity. **Virus Evolution** 3(1).

Machalaba CC, Elwood SE, Forcella S, Karesh WB. Global avian influenza surveillance in wild birds: A strategy to capture viral diversity. (2015) **Emerging Infectious Diseases** 21(4):e1-7.

Alagaili AN, Briese T, Mishra N, Kapoor V, Sameroff SC, de Wit E, Munster VJ, Hensley LE, Zalmout IS, Kapoor A, Epstein JH, Karesh WB, Daszak P, Mohammed OB, Lipkin WI. (2014) Middle East Respiratory Syndrome Coronavirus infection in dromedary camels in Saudi Arabia. **mBio** 5(2):e00884-14.

Karesh WB, Dobson A, Lloyd-Smith JO, Lubroth J, Dixon MA, Bennett M, Aldrich S, Harrington T, Formenty P, Loh EH, *Machalaba CC*, Thomas MJ, Heymann DL. (2012) Ecology of zoonoses: Natural and unnatural histories. **The Lancet** 380(9857):1936-45.

Gaidet N, Caron A, Cappelle J, Cumming GS, Balanca G, Hammoumi S, Cattoli G, Abolnik C, De Almeida RS, Gil P, Fereidouni SR, Grosbois V, Tran A, Mundava J, Fofana B, El Mamy ABO, Ndlovu M, Mondain-Monval JY, Triplet P, Hagemeijer W, Karesh WB, Newman SH, Dodman T. (2012) Understanding the ecological drivers of avian influenza virus infection in wildfowl: A continental-scale study across Africa. **Proceedings of the Royal Society B: Biological Sciences** 279(1731):1131-41.

Morse SS, Mazet JAK, Woolhouse M, Parrish CR, Carroll D, Karesh WB, Zambrana-Torrelio C, Lipkin WI, Daszak P. (2012) Prediction and prevention of the next pandemic zoonosis. **The Lancet** 380:1956-65.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding the Risk of Bat-Bourne Zoonotic Disease Emergence in Western Asia

Source of Support: DTRA

Total Award Amount: $4,391,443.65 Total Award Period Covered: 10/02/2017 - 10/01/2022

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Ground Truth Network

Source of Support: DHS

Total Award Amount: $2,231,114.13 Total Award Period Covered: 09/30/2016 - 09/29/2021

Location of Project: USA

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

READY: Augmenting Capacity for Humanitarian Emergencies of Infectious Diseases with Epidemic or Pandemic Potential

Source of Support: USAID

Total Award Amount: $143,605 Total Award Period Covered: 09/25/2018 - 09/30/2021

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.56 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 4.56 Acad: Sumr:

---

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: William Karesh	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Crimean-Congo hemorrhagic fever: Reducing an emerging health threat in Tanzania

Source of Support: DTRA
Total Award Amount: $4,848,483 Total Award Period Covered: 10/01/2019 - 07/31/2024
Location of Project: USA, Tanzania
Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA
Total Award Amount: $4,988,526 Total Award Period Covered: 06/01/2019 - 05/31/2024
Location of Project: USA, South Africa
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH
Total Award Amount: $7,307,869 Total Award Period Covered: 03/01/2020 - 02/28/2025
Location of Project: Global
Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat from high-risk pathogens causing febrile illness in Liberia

Source of Support: DTRA
Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 - 12/31/2024
Location of Project: USA, Liberia
Person-Months Per Year Committed to the Cal: 1.5 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Ehab A. Abu-Basha
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: abubasha@just.edu.jo

Professional Preparation

Jordan Uni. of Sci and Tech.	Veterinary Medicine	DVM	1994
Iowa State University	Vet. Pharmacology	MSc	1998
Iowa State University	Vet. Pharmacology/Toxic.	PhD	2002

Appointments

Country Coordinator, USAID EPT PREDICT-2	2016 - present
Vice President, Med. Network of Establishments for Vet. Education	2016 - present
Member, Council on Int'l Vet. Med. Edu./Assoc. of American Vet. Med. Col.	2016 - present
Dean, Faculty of Vet. Med., JUST	2013 - 2016
Vice Dean, Faculty of Vet. Med., JUST	2009 - 2013
Fulbright Fellow, Col. of Vet. Med., Iowa State University	2008 - 2009
Head, Dept. of Vet. Basic Sciences, Faculty of Vet. Med., JUST	2004 - 2008
Research and Teaching Assistant, Col. of Vet. Med., Iowa State University	1997 - 2002
Veterinarian, Animal Clinical Center, Faculty of Vet. Med., JUST	1994 - 1996

Publications

Ibrahim RA, Cryer TL, Lafi SQ, Abu-Basha EA, Good L, Tarazi YH. (2019) Identification of *Escherichia coli* from broiler chickens in Jordan, their antimicrobial resistance, gene characterization and the associated risk factors. **BMC Veterinary Research** 15(1):159.

Neves MI, Malkawi I, Walker M, Alaboudi A, Abu-Basha E, Blake DP, Guitian J, Crotta M. (2019) The transmission dynamics of *Campylobacter jejuni* among broilers in semi-commercial farms in Jordan. **Epidemiology & Infection** 147:e134.

van Doremalen N, *Hijazeen ZS*, Holloway P, Al *Omari B*, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, Abu-Basha E, Al-Majali AM, Munster VJ, Richt JA. (2019) High Prevalence of Middle East Respiratory Coronavirus in Young Dromedary Camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Holloway P, Musallam I, Whiting M, Good L, Van Winden S, SilvaFletcher A, *Ababneh M*, Abu-Basha E, Guitian J. (2015) Building capacity to reduce biological threats in the Middle East. **Veterinary Record** 177(13):337-338.

Khalifeh MS, Abu-Basha EA. (2014) Boosting Newcastle disease vaccination efficacy under field conditions by aromatic plant essential oil extracts. **Veterinary Science Development** 4(2).

Abu-Basha EA, *Gharaibeh SM*, Thabet AM. (2015) In-vitro susceptibility of resistant *Escherichia coli* field isolates to antimicrobial combinations. **Journal of Applied Poultry Research** 21:595-602.

Catherine C. Machalaba
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001, USA
E-mail: machalaba@ecohealthalliance.org

Professional Preparation

Wake Forest University	Biology	BA	2008
Dartmouth Medical School	Public Health	MPH	2009
City University of New York	Environ. Health	PhD	2014 - present

Appointments

Research Scientist, EcoHealth Alliance	2018 - present
Policy Advisor, EcoHealth Alliance	2017 - present
Chair, Veterinary Public Health Group, American Public Health Association	2016 - present
Project Science Officer/IPO Lead, Future Earth oneHEALTH Project	2013 - present
Program Officer, IUCN SSC Wildlife Health Specialist Group	2010 - present
Program Coordinator for Health and Policy, EcoHealth Alliance	2010 - 2017
Fellow, Veterans Engineering Recourse Center, VA Boston Healthcare System	2009 - 2010
Field Agent and Educator, Vermont Department of Health	2005

Publications

Smith KM, Machalaba C, Seifman R, Feferholtz Y, *Karesh WB*. (2019) Infectious disease and economics: The case for considering multisectoral impacts. **One Health** 7:100080.

Berthe FCJ, Bouley T, *Karesh WB*, Le Gall FG, Machalaba CC, Plante CA, Seifman RM. (2018) Operational framework for strengthening human, animal and environmental public health systems at their interface. Washington, D.C.: **World Bank Group**.

Machalaba C, Salerno RH, Barton Behrevesh C, Benigno S, Berthe FCJ, Chungong S, Duale S, Echalar R, *Karesh WB*, Ormel HJ, Pelican K, Rahman M, Rasmuson M, Scribner S, Stratton J, Suryantoro L, Wannous C. (2018) Institutionalizing One Health: From assessment to action. **Health Security** 16(S1):S37-S43.

Schar D, Yamey G, Machalaba C, *Karesh WB*. (2018) A framework for stimulating economic investments to prevent emerging diseases. **Bulletin of the World Health Organization** 96(2):138-140.

Rostal MK, Ross N, Machalaba C, Cordel C, Paweska JT, *Karesh WB*. (2018) Benefits of a One Health approach: An example using Rift Valley fever. **One Health** 5:34-36.

Machalaba C, Smith K, Awada L, Berry K, Berthe F, Bouley TA, Bruce M, Cortiñas Abrahantes J, El Turabi A, Feferholtz Y, Flynn L, Fournié G, *Andre A*, Grace D, Jonas O, Kimani T, Le Gall F, Miranda JJ, Peyre M, Pinto J, Ross N, Ruegg S, Salerno RH, Seifman R, Zambrana-Torrelio C, *Karesh WB*. (2017) One Health economics to confront disease threats. **Transactions of the Royal Society of Tropical Medicine and Hygiene** 111(6):235-237.

Machalaba C, *Karesh WB*. (2017) Emerging infectious disease risk: Shared drivers with environmental change. **OIE Scientific and Technical Review** 36(2):435-444.

Baum SE, Machalaba C, Salerno RH, Daszak P, *Karesh WB*. (2016) Evaluating One Health: Are we demonstrating effectiveness? **One Health** 3:5-10.

Kelley TR, *Karesh WB*, Kreuder Johnson C, Gilardi KVK, Anthony SJ, Goldstein T, Olson SH, Machalaba C, PREDICT Consortium, Mazet JAK. (2017) One Health proof of concept: Bringing a transdisciplinary approach to surveillance for zoonotic viruses at the human-wild animal interface. **Preventive Veterinary Medicine** 137:112 118.

Hani A. M. Talafha
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: hanit@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Ag. Sci.; Ani. Prod.	BS	1998
The University of Sydney	Animal Science	MS	2006

Appointments

Director of Research Services and Lecturer, JUST	2017 - present
Field Coordinator Jordan, EPT PREDICT-2	2016 - 2019
Head, Auditing and Monitoring of Research, Deanship of Research, JUST	2016 - 2017
Lecturer and Lab Supervisor, JUST	2011 - 2016
Lab Supervisor, Center for Extension and Livestock Research, JUST	2008 - 2011
Lab Technician, JUST	2000 - 2004
Research Assistant, JUST	1998 - 2000

Publications

Dawson P, *Abu-Basha E*, Amarneh B, Fahmawi A, Alshammari A, Alzaqa E, *Hijazeen Z*, Talafha H, *Omari B*, *Al-Zghoul MB*, *Ababneh M*, *Ismail ZB, Karesh WB*. (2019) Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human disease risks among persons at camel farms, abattoirs, and meat markets in Jordan. **International Journal of Infectious Diseases** 79(1):63–64.

van Doremalen N, *Hijazeen ZSK*, Holloway P, *Al-Omari B*, McDowell C, Adney D, Talafha HA, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2016) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne and Zoonotic Diseases** 17(2):155-159.

Jawasreh KIZ, AL-Rawashdeh IM, Al-Majali A, Talafha H, Eljarah A, Awawdeh F. (2011) Genetic 13 relatedness among Jordanian local Awassi linens Baladi, Saqri, and Blackface and the Najdi breed using RAPD analysis. **Genomics and Quantitative Genetics** 2:31-36.

Al-Majali AM, Jawasreh K, Talafha H. (2008) Epidemiology of Neoporosis in sheep and different breeds of goats in Jordan. **American Journal of Animal and Veterinary Science** 3:47-52.

Haddad SG, Mahmoud KZ, Talafha HA. (2005) Effect of varying levels of dietary undegradable protein on nutrient intake, digestibility and growth performance of Awassi lambs fed on high wheat straw diets. **Small Ruminant Research** 58(3):231-236.

Moh'd Borhan Al-Zghoul
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: alzghoul@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1996
Purdue University	Immunology	MS	2000
Purdue University	Mole. and Dev. Biology	PhD	2003

Appointments

Vice Dean, Department of Basic Medical Veterinary Sciences, JUST	2018 - present
Assistant Dean, Department of Basic Medical Veterinary Sciences, JUST	2016 - 2017
Head, Department of Basic Medical Veterinary Sciences, JUST	2008 - 2010

Publications

Al-Zghoul M B, Saleh KM, *Ababneh MMK*. (2019) Effects of pre-hatch thermal manipulation and post-hatch acute heat stress on the mRNA expression of interleukin-6 and genes involved in its induction pathways in 2 broiler chicken breeds. **Poultry Science** 98(4):1805-1819.

Al-Zghoul MB, Sukker H, *Ababneh MM*. (2019) Effect of thermal manipulation of broilers embryos on the response to heat-induced oxidative stress. **Poultry Science** 98(2):991-1001.

Al-Zghoul MB, Al-Natour MQ, Dalab AS, Alturki OI, Althnaian TA, Al-ramadan YS, Hannon KM. (2016) Thermal manipulation mid-term broiler chicken embryogenesis: Effect on muscle growth factors and muscle marker genes. **Brazilian Journal of Poultry Science** 18(4):607-618.

Ababneh M, Dalab A, Alsaad S, Al-Zghoul MB. (2012) Presence of infectious bronchitis virus strain CK/CH/LDL/97I in the Middle East. **ISRN Veterinary Science**

Ababneh MM, Al-Rukibat RK, Hananeh WM, Nasar AT, Al-Zghoul MB. (2012) Detection and molecular characterization of bovine leukemia viruses from Jordan. **Archives of Virology** 157:2343-2348.

Ababneh MMK, Dalab AE, Alsaad SR, Al-Zghoul MB, Al-Natour MQ. (2012) Molecular characterization of a recent Newcastle disease virus outbreak in Jordan. **Research in Veterinary Science** 93:1512-1514.

Wail Hayajneh
Food and Drug Administration (FDA), Amman, Jordan
E-mail: wialh@just.edu.jo

Professional Preparation

University of Jordan	Medicine	MBBS	1991
St. Joseph's Children Hospital	Residency - Pediatrics		1997
Children's Nat. Medical Center	Pediatric Infect. Dis. Flwsh		1998 – 2001

Appointments

Chairman, Infectious Diseases Committee, Jordan FDA	2018 - present
Dean, School of Medicine, JUST	2016 - 2018
Head, Infection Control Committee, King Abdullah University Hospital	2012 - present
Member, Institutional Board Review, King Abdullah University Hospital	2012 - 2016
Deputy Chief Executive Officer, King Abdullah University Hospital Mar	2012 - 2014
Chairman, Jordanian Pediatric Board Committee	2008 - 2012
Head, Jordanian Vaccine and Sera Licensing and Re-licensing Committee	2006 - 2007

Publications

Hajj A, Adaimé A, Hayajneh W, Abdallah A, Itani T, Hakimé N, Mallah M, Alsamarneh R, Badal R, Sarkis DK. (2018) Post Syrian war impact on susceptibility rates and trends in molecular characterization of *Enterobacteriaceae*. **Future Microbiology** 13(12):1419-1430.

Hayajneh WA, Daniels VJ, James CK, Kanibir MN, Pilsbury M, Marks M, Govcia MG, Elbasha EH, Dasbach E, Acosta CJ. (2018) Public health impact and cost effectiveness of routine childhood vaccination for hepatitis A in Jordan: A dynamic model approach. **BMC Infectious Diseases** 18(1):119.

Almomani BA, Hayajneh WA, Ayoub AM, *Ababneh MA*, Al Momani MA. (2018) Clinical patterns, epidemiology and risk factors of community-acquired urinary tract infection caused by extended-spectrum beta-lactamase producers: A prospective hospital case-control study. **Infection** 1-7.

Hayajneh W, Alhamad N, Shotar A, Almaaita S, Abuzeid H. (2018) Teicoplanin versus vancomycin in children of North Jordan: A comparative safety study. **Jordan Medical Journal** 52:15-25.

Hayajneh W, Al-Abdullat M, Al Shurman A, Maalouf J, Kutler B, Weiss T, Daniels C, Wolfson L. (2017) Estimating the health and economic impact of universal varicella 13 vaccination in Jordan. **Open Forum Infectious Diseases** 4(1):S309-S310.

Jaradat Z, Hamdan T, Hayajneh W, Al Mousa W, Shehabi A. (2017) Antimicrobial susceptibility, toxin profiling and molecular typing of *Staphylococcus aureus* isolates from two tertiary hospitals in Jordan. **The Journal of Infection in Developing Countries** 11:876-886.

Masaadeh H, Hayajneh W, Al Azzam I, Alkhatib A. (2016) Prevalence of streptococcus pneumoniae serotypes (Nasopharyngeal colonization) in children in North Jordan: Genotypic and phenotypic characteristics. **Research Journal of Biological Sciences** 11:23-33.

Mukattash TL, Hayajneh WA, Ibrahim SM, Ayoub A, Ayoub N, Jarab AS, Khdour M, Almaaytah A. (2016) Prevalence and nature of off-label antibiotic prescribing for children in a tertiary setting: A descriptive study from Jordan. **Pharmacy Practice (Granada)** 14(3).

Samrah S, Bashtawi Y, Hayajneh W, Almomani B, Momany S, Khader Y. (2016) Impact of colistin-initiation delay on mortality of ventilator-associated pneumonia caused by *A. baumannii*. **The Journal of Infection in Developing Countries** 10(10):1129-1134.

Zaidoun Saleh Hijazeen
Food and Agriculture Organization of the United Nations (FAO), Amman, Jordan
E-mail: zaidoun.hijazeen@fao.org

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	2003
Jordan Uni. of Sci. and Tech.	Vet. Int. Med. and Epi.	MS	2012

Appointments

National Consultant, FAO	2016 - present
Veterinarian, Ministry of Environment, UAE	2015 - 2016
Pathologist, Central Veterinary Laboratory-Ministry of Agriculture	2013 - 2015
Pathologist, Central Veterinary Laboratory-Ministry of Agriculture	2003 - 2010

Publications

van Doremalen N, Hijazeen ZSK, Holloway P, *Al-Omari B*, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2016) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Dawson P, Abu-Basha E, Amarneh B, Fahmawi A, Alshammari A, Alzaqa E , Hijazeen Z, *Talafha H, Al-Omari B, Al-Zghoul MB, Ababneh M, Ismail ZB, Karesh WB.* (2019) Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human disease risks among persons at camel farms, abattoirs, and meat markets in Jordan. **International Journal of Infectious Diseases** 79(1):63 64.

Abutarbush SM, Hijazeen ZSK, Doodeen R, Hawawsheh M, Ramadneh W, Al Hanatleh M. (2018) Analysis, description and mapping of camel value chain in Jordan. **Global Veterinarian** 20(3):144-152.

Patrick T. Dawson
Centers for Disease Control and Prevention (CDC), 1600 Clifton Road, Atlanta, GA 30329
E-mail: patrick.t.dawson@gmail.com

Professional Preparation

Northwestern University	Biological Sciences	BA	2010
Columbia University	Epidemiology	MPH	2012
Columbia University	Epidemiology	PhD	2019

Appointments

Epidemic Intelligence Service Officer, CDC	2019 - present
Research Scientist, EcoHealth Alliance, New York, NY	2016 - 2019
Teaching Assistant, Columbia University Mailman School of Public Health	2014 - 2019
Regional Epidemiologist, U.S. CDC, Egypt	2012 - 2014
Epi Scholar, New York City Department of Health and Mental Hygiene	2011 - 2012
Research Assistant, Columbia University Mailman School of Public Health	2010 - 2012
Intern, EdgeAlliance AIDScare Progressive Services	2009 - 2010
Intern, Bayshore Hospital, Holmdel, NJ	2007 - 2009

Publications and Presentations

Kandeil A, Gomaa MR, Shehata MM, El Taweel AN, Mahmoud SH, Bagato O, Moatasim Y, Kutkat O, Kayed AS, Dawson P, Qui X, Bahl J, Webby RJ, *Karesh WB*, *Kayali G*, Ali MA (2018) Isolation and characterization of a distinct influenza A virus from Egyptian bats. **Journal of Virology** 93(2):e01059-18.

Dawson P, *Abu-Basha E*, *Amarneh B*, Fahmawi A, Alshammari A, Alzaqa E, *Hijazeen Z*, *Talafha H, Omari B, Al-Zghoul B, Ababneh M, Ismail ZB, Karesh WB* (2018). Knowledge, attitudes, beliefs, and practices pertaining to camel-to-human hisease risks in Jordan. **International Meeting on Emerging Diseases and Surveillance (IMED)**, Vienna, Austria (poster).

Dawson P, *Karesh WB*, Kandeil A, Sayed A, Ali MA, *Kayali G.* (2018) Identifying behavioral risk intervention points to prevent zoonotic spillover at animal markets, farms, and abattoirs in Egypt. **18th International Congress on Infectious Diseases**, Buenos Aires, Argentina (oral presentation, Zoonoses & One Health).

Abdallat M, Dawson P, Haddadin AJ, El-Shoubary W, Dueger E, Sanouri T, Said MM, Talaat M. (2016) Influenza hospitalization epidemiology from a Severe Acute Respiratory Infection surveillance system in Jordan, January 2008 February 2014. **Influenza and Other Respiratory Viruses** 10(2):91-7.

Dawson P, Perri BR, Ahuja SD. (2016) High tuberculosis strain diversity among New York City public housing residents. **American Journal of Public Health** 106(3):563-8.

Kandeel A, Dawson P, Labib M, Said M, Refaey S, Naguib A, Talaat M. (2016) Morbidity, mortality, and seasonality of influenza hospitalizations in Egypt, November 2007-November 2014. **PLOS ONE** 11(9):e0161301.

Ghazi Kayali
Human Link, Camelia 2 bldg, Said Freiha Street, Hazmieh, Baabda 1109, Lebanon
E-mail: ghazi@human-link.org

Professional Preparation

American University of Beirut	Environmental Health	BS	1996
American University of Beirut	Epidemiology & Biostats.	MPH	1998
University of Iowa	Epidemiology	PhD	2008

Appointments

Associate Editor, BMC Infectious Diseases	2019 - present
Chief Executive Officer, Human Link, Lebanon	2016 - present
Expert, WHO International Health Regulation Roster of Experts	2014 - present
Advisor, WHO EMRO, PIP, One Health, Zoonoses	2011 - present
Staff Scientist, St. Jude Children's Research Hospital	2014 - 2016
Postdoc Fellow, St. Jude Children's Research Hospital	2008 - 2014
Research Assistant, Department of Epidemiology, University of Iowa	2005 - 2008
Environmental Health Specialist, King Abdulaziz Medical City, Saudi Arabia	2001 - 2005

Publications

Kandeil A, Gomaa M, Shehata M, El-Taweel A, Kayed AE, Abiadh A, Jrijer J, Moatasim Y, Kutkat O, Bagato O, Mahmoud S, Mostafa A, El-Shesheny R, Perera RA, Ko RL, Saad A, McKenzie PP, Webby RJ, Peiris M, Ali MA, Kayali G. (2019) Middle East Respiratory Syndrome Coronavirus infection in non-camelid domestic mammals. **Emerging Microbes & Infections** 8(1):103-108.

Ali MA, Shehata MM, Gomaa MR, Kandeil A, El-Shesheny R, Kayed AS, El-Taweel AN, Atea M, Hassan N, Bagato O, Moatasim Y, Mahmoud SH, Kutkat O, Maatouq AM, Osman A, McKenzie PP, Webby RJ, Kayali G. (2017) Systematic, active surveillance for Middle East Respiratory Syndrome Coronavirus in camels in Egypt. **Emerging Microbes & Infections** 6(1):e1.

Kandeil A, Shehata MM, El Shesheny R, Gomaa MR, Ali MA, Kayali G. (2016) Complete genome sequence of Middle East Respiratory Syndrome Coronavirus isolated from a dromedary camel in Egypt. **Genome Announcement** 4(2):e00309-16.

Kayali G, Peiris M. (2015) A more detailed picture of the epidemiology of Middle East Respiratory Syndrome Coronavirus. **The Lancet Infectious Diseases** 15(5):495-497.

Crameri G, Durr PA, Barr J, Yu M, Graham K, Williams OJ, Kayali G, Smith D, Peiris M, Mackenzie JS, Wang LF. (2015) Absence of MERS-CoV antibodies in feral camels in Australia: Implications for the pathogen's origin and spread. **One Health** 1:76-82.

Zhao J, Perera RA, Kayali G, Meyerholz D, Perlman S, Peiris M. (2015) Passive immunotherapy with dromedary immune serum in an experimental animal model for Middle East Respiratory Syndrome Coronavirus infection. **Journal of Virology** 89(11):6117-20.

Chan RW, Hemida MG, Kayali G, Chu DK, Poon LL, Alnaeem A, Ali MA, Tao KP, Ng HY, Chan MC, Guan Y, Nicholls JM, Peiris JS. (2014) Tropism and replication of Middle East Respiratory Syndrome Coronavirus from dromedary camels in the human respiratory tract: An in-vitro and ex-vivo study. **The Lancet Respiratory Medicine** 2(10):813-822.

Shehata MM, Gomaa MR, Ali MA, Kayali G. (2010) Middle East Respiratory Syndrome Coronavirus: A comprehensive review. **Frontiers of Medicine** 10(2):120-136.

Mustafa Ababneh
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: ababnem@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1999
Purdue University	Veterinary Microbio./Viro.	PhD	2001 - 2005

Appointments

Faculty, Department of Basic Medical Sciences, JUST	2005 - present
Post-doctoral Fulbright Fellow, University of Georgia	2015 - 2016
Assistant Dean, JUST	2009 - 2010
Post-doctoral Fellow, John Curtin Sch. of Med. Res., Australian Nat'l Uni.	2008 - 2009

Publications

Ababneh M, Ferreira HL, Khalifeh M, Suarez DL, Afonso CL. (2018) First genome sequence of Newcastle disease virus of genotype VIII from Jordan. **Microbiology Resource Announcement** 7(23):e01136-18.

Wajid A, Dimitrov KM, Wasim M, Rehmani SF, Basharat A, Bibi T, Arif S, Yaqub T, Tayyab M, Ababneh M, Sharma P, Miller PJ, Afonso CL. (2017) Repeated isolation of virulent Newcastle disease viruses in poultry and captive non-poultry avian species in Pakistan from 2011 to 2016. **Preventative Veterinary Medicine** 142:1-6.

Hananeh WM, Momani WM, Ababneh MM, Abutarbush SM. (2018) Mycoplasma bovis arthritis and pneumonia in calves in Jordan: An emerging disease. **Veterinary World** 11(12):1663-1668.

Reusken C, Ababneh M, Raj V, Meyer B, Eljarah A, Abutarbush S, Godeke G, Bestebroer T, Zutt I, Muller M, Bosch B, Rottier P, Osterhaus A, Drosten C, Haagmans B, Koopmans M. (2013) Middle East Respiratory Syndrome Coronavirus (MERS-CoV) serology in major livestock species in an affected region in Jordan, June to September 2013. **Euro Surveillance** 18(50).

Abutarbush SM, Ababneh MM, Al Zoubi IG, Al Sheyab OM, Al Zoubi MG, Alekish MO, Al Gharabat RJ. (2013) Lumpy Skin Disease in Jordan: Disease emergence, clinical signs, complications and preliminary-associated economic losses. **Transboundary and Emerging Diseases** 62(5):549-554.

Al-Zhgoul MB, Dalab AE, Ababneh MM, Jawasreh KI, Al Busadah KA, *Ismail ZB*. (2013) Thermal manipulation during chicken embryogenesis results in enhanced Hsp70 gene expression and the acquisition of thermotolerance. **Research in Veterinary Science** 95(2):502-507.

Ababneh MM, Hananeh WM, Dalab AE. (2012) Molecular and histopathological characterization of sheep-associated malignant catarrhal fever (SA-MCF) outbreak in beef cattle. **Transboundary and Emerging Diseases** 6(1):75-80.

Ababneh MM, Al-Rukibat RK, Hananeh WM, Nasar AT, *Al-Zghoul MB*. (2012) Detection and molecular characterization of bovine leukemia viruses from Jordan. **Archives of Virology** 157(12):2343-8.

Eljarah A, *Al-Zghoul MB*, Jawasreh K, Ababneh M, Alsumadi M, Alhalah A, *Ismail ZB*. (2012) Characterization of male reproductive anatomy of the endangered Arabian oryx (*Oryx leucoryx*). **Theriogenology** 78(1):159-64.

Emily A. Hagan
EcoHealth Alliance, 460 W. 34th St. New York, NY 10001
E-mail: hagan@ecohealthalliance.org

Professional Preparation

Hiram College, OH	Bio., Biomed. Humanities	BS	2008
Columbia University, NY	Epidemiology	MPH	2013

Appointments

Research Scientist, EcoHealth Alliance	2016 - present
PREDICT Bangladesh Country Liaison, EcoHealth Alliance	2016 - present
Research Coordinator, EcoHealth Alliance	2015 - 2016
Research Assistant, EcoHealth Alliance	2013 - 2015
Team Manager, Beth Israel Deaconess Medical Center	2011 - 2012
Research Assistant, Beth Israel Deaconess Medical Center	2008 - 2012
Teaching Assistant, Hiram College Organic Chemistry Department	2007 - 2008
NSF REU Research Intern, University of Akron, Polymer Department	2007 - 2007
Researcher, Hiram College Cellular and Molecular Lab	2006 - 2007

Publications

Wang N, Li S, Yang X, Huang H, Zhang Y, Guo H, Luo C, Miller M, Zhu G, Chmura AA, Hagan E, Zhou J, Zhang Y, Wang L, Daszak P, Shi Z (2018) Serological evidence of bat SARS- related coronavirus infection in humans, China. **Virologica Sinica** 33(1):104-107.

Miller M, Hagan E (2017) Integrated biological behavioural surveillance in pandemic-threat warning systems. **Bulletin of the World Health Organization** 95(1):62.

Mazet JAK, Wei Q, Zhao G, Cummings D, Desmond JA, Rosenthal J, King CH, Cao, Wuchun, Chmura A, Hagan EA, Zhang S, Xiao X, Xu JA, Zhengli S, Liu X, Pan W, Zhu GA, Zuo L, Daszak P. (2015) Joint China–US Call for an Interdisciplinary Approach to Emerging Infectious Diseases. **EcoHealth** 12(50).

Schmitz JE, Ma ZM, Hagan EA, Wilks AB, Furr KL, Linde CH, Zahn RC, Brenchley JM, Miller CJ, Permar SR. (2012) Memory CD4+ T lymphocytes in the gastrointestinal tract area major reservoir of simian immunodeficiency virus in chronic nonpathogenic infection of African green monkeys. **Journal of Virology** 86(20):11380-5.

Finstad S, Zhang G, Jin C, Linde C, Hagan EA, de la Rosa M, Zahn RC, Wang X, Reimann K, Gaufin T, Apetrei C, Pandrea I, Miller CJ, McCune J, Picker LJ, Lifson J, Piatak M, Alter G, Veazey RS, Barouch D, Hessell AJ, Burton DR, Nimmerjahn F, Alexander F, Alam SM, Haynes B, Gelman R, Brusic V, Letvin N, Schmitz JE. (2010) Effect of Fc gamma-r receptor polymorphisms in rhesus macaques on SIVmac251 setpoint viremia. **AIDS Research and Human Retroviruses** 26(10):A20-A20.

Niewiarowski PH, Lopez S, Ge L, Hagan E, Dhinojwala A. (2008) Sticky gecko feet: The role of temperature and humidity. **PLoS ONE** 3(5) e2192.

Zuhair Bani Ismail
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail: zuhair72@just.edu.jo

Professional Preparation

Jordan Uni. of Sci. and Tech.	Veterinary Medicine	BS	1995
Purdue University	Internship, Large Animal		1995 - 1998
Purdue University	Residency - Large Animal		1998 - 2001

Appointments

Professor, Dept. of Clinical Veterinary Medical Sciences, JUST	2013 - present
Department Head, Dept. of Clinical Veterinary Medical Sciences, JUST	2013 - 2016
Assist. Dean, Col. of Vet. Med. and Ani. Res., King Faisal University	2011 - 2013
Department Head, Clinical Veterinary Medical Sciences, JUST	2007 - 2009
Assistant Dean, Department of Clinical Veterinary Medical Sciences, JUST	2004 - 2007

Publications

Ismail ZB, Abutarbush SM, Al-Majali A, Gharaibeh MH, Al-Khateeb B. (2019) Seroprevalence and risk factors of *Leptospira* serovar Pomona and *Leptospira* serovar Hardjo infection in dairy cows in Jordan. **The Journal of Infection in Developing Countries** 13(6):473-479.

Ismail ZB, Muhaffel MM, *Abu-Basha E.* (2018) The effect of dry cow therapy using systemic tylosin in combination with common intramammary medications on mastitis rate, cull rate, somatic cell count, and milk production in dairy cows affected with subclinical mastitis. **Veterinary World** 11(9):1266-1271.

Ismail ZB. (2017) Mastitis vaccines in dairy cows: Recent developments and recommendations of application. **Veterinary World** 10(9):1057-1062.

Ismail ZB. (2017) Molecular characteristics, antibiogram and prevalence of multi-drug resistant *Staphylococcus aureus* (MDRSA) isolated from milk obtained from culled dairy cows and from cows with acute clinical mastitis. **Asian Pacific Journal of Tropical Biomedicine** 7(8).

Ismail ZB. (2017) Pneumonia in Dromedary camels (*Camelus dromedarius*): A review of clinico-pathological and etiological characteristics. **Journal of Camel Practice and Research** 24(1):49-54.

Bilal Abduh Al Omari
Jordan University of Science and Technology (JUST), Irbid 22110, Jordan
E-mail:

Professional Preparation

Jordan Uni. of Sci. and Tech.	Medical Technology	BSc	1990

Appointments

Supervisor of the Diagnostic Laboratory, Veterinary Health Center, JUST	2002 - present
Faculty, Department of Clinical Veterinary Medical Sciences, JUST	2002 - present
Teaching Assistant, Dept of Clinical Veterinary Medical Sciences, JUST	1993 - 2002
Research Assistant, Biotechnology Laboratory, JUST	1992 - 1993

Publications

van Doremalen N, *Hijazeen ZS*, Holloway P, Al Omari B, McDowell C, Adney D, *Talafha HA*, Guitian J, Steel J, Amarin N, Tibbo M, *Abu-Basha E*, Al-Majali AM, Munster VJ, Richt JA. (2017) High prevalence of Middle East Respiratory Coronavirus in young dromedary camels in Jordan. **Vector Borne Zoonotic Diseases** 17(2):155-159.

Al-Essa MK, Abu Baker N, Alzoubi K, *Al-Zhgoul MB*, Khlouf S, Al-Saleh AR, Al-Omari B, Abu-Tayeh R, Shomaf M, Battah A, Al-Hadidi K, *Ismail ZB*. (2012) Evaluation of the subacute toxic effects of an isotonic D-ribose solution administered intravenously to Fischer Rats. **Jordan Journal of Pharmaceutical Sciences** 5(2).

Ismail ZB, Abu-Baker N, Alzoubi K, *Al-Zhgoul MB*, Al-Essa MK, Khlouf S, Al-Saleh A, Al-Omari B, Abu-Tayeh R, Shomaf M, Battah A, Al-Hadidi K. (2012) Evaluation of *D-ribofuranose* (D-ribose) toxicity after intravenous administration to rabbits. **Human & Experimental Toxicology** 31(8):820-9.

Ismail ZAB, Al-Majali A, *Ababneh H*, Al-Omari B. (2007) Laryngeal Leeches causing exercise intolerance, respiratory distress and hemoptysis in a hunting dog. **Internet Journal of Internal Medicine** 3(1).

Whitney O. Bagge
EcoHealth Alliance, 460 W. 34th St, New York City, NY 10001, USA
E-mail: bagge@ecohealthalliance.org

Professional Preparation

Uni. of California, San Diego	International Studies	BA	2008
Yale University	Public Health	MPH	2011
Stanford University	Envir. and Resources	PhD	2017

Appointments

Disease Ecologist, EcoHealth Alliance	2018 - present
Volunteer, World Health Organization	2018 - 2018
Editor, Edanz Group Japan KK	2017 - 2018
English Teacher, Sakkara Language School, Cairo, Egypt	2008 - 2009

Publications

Anderson N, Bagge W, Webber C, Zarras P, Davis MC. (2008) Procedure for the rapid synthesis of the monomer 1,4-Bis(chloromethyl)-2-(2-ethylhexyloxy)-5-methoxybenzene. **Synthetic Communications** 38(22):3903-3908.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Bilal Al Omari

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: 1,200,000 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 4.8 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Zuhair Bani Ismail	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global, Jordan

Person-Months Per Year Committed to the Cal:12 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: 36 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Whitney O. Bagge

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 2.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA

Total Award Amount: $4,988,526 Total Award Period Covered: 08/15/2019 - 08/14/2024

Location of Project: USA, South Africa

Person-Months Per Year Committed to the Cal:12 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Catherine C. Machalaba	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 6.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the threat of Rift Valley Fever through Ecology, Epidemiology and Socio-Economics

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, South Africa

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Health Alert Forecasting through Climate, Land use & Infectious Disease Monitoring

Source of Support: Belmont Forum/NOAA

Total Award Amount: $1,300,000.00 Total Award Period Covered: 01/01/2020 - 12/31/2022

Location of Project: USA

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.5 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

READY

Source of Support: USAID

Total Award Amount: $143,605.00 Total Award Period Covered: 09/25/2018 - 09/30/2021

Location of Project: USA

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator:

Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

One Health Workforce

Source of Support: USAID

Total Award Amount: $5,040,700 Total Award Period Covered: 10/19/2019 - 10/18/2024

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.1 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Moh'D Borhan Al-Zghoul

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Mustafa Ababneh	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 4.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria. TCP/JOR/3502. Project Leader.

Source of Support: FAO/USAID

Total Award Amount: 95,000 USD. Total Award Period Covered: 2015-2017

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan. OSRO/GLU/505/USA. Project Leader.

Source of Support: FAO/USAID

Total Award Amount: 45,000 USD. Total Award Period Covered: 2016-2017

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Zaidoun Saleh Hijazeen	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan

Source of Support: USAID

Total Award Amount: $955,000.00 Total Award Period Covered: 01/04/2016 - 12/31/2020

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 9.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Hani Ahmad Talafha

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA
Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024
Location of Project: USA, Jordan
Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:
Emerging Pandemic Threats PREDICT-2

Source of Support: USAID
Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014 - 9/30/2019
Location of Project: Global
Person-Months Per Year Committed to the Cal: 4.8 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ghazi Kayali | Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,465,477.43 Total Award Period Covered: 06/23/2016-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 1.2 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Ecology of Avian Influenza and MERSCoV in the Middle East and Africa

Source of Support: NIH

Total Award Amount: $5,361,497.58 Total Award Period Covered: 09/22/2014-03/31/2021

Location of Project: Global

Person-Months Per Year Committed to the Cal: 10.8 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Supporting the Zoonotic Disease Committee in Egypt

Source of Support: DOS BEP

Total Award Amount: $76,697.80 Total Award Period Covered: 10/1/2019 – 09/30/2020

Location of Project: Egypt

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ehab Abu-Basha	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 12.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $1,200,000.00 Total Award Period Covered: 10/01/2014-09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 8.4 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Educational Twining program between Royal Veterinary College and Jordan University of Science and Technology

Source of Support: OIE

Total Award Amount: $726,720.67 Total Award Period Covered: 01/01/2014 – 12/31/2019

Location of Project: Jordan

Person-Months Per Year Committed to the Cal: 3.6 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Emily Hagan	Other agencies (including NSF) to which this proposal has

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat from high-risk pathogens causing febrile illness in Liberia

Source of Support: DTRA

Total Award Amount: $4,912,818.06 Total Award Period Covered: 01/01/2020 - 12/31/2024

Location of Project: USA, Liberia

Person-Months Per Year Committed to the Cal: 4.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Emerging Pandemic Threats PREDICT-2

Source of Support: USAID

Total Award Amount: $100,000,000.00 Total Award Period Covered: 10/01/2014 - 09/30/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 12 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Understanding filovirus diversity in bat reservoirs and implications for human outbreaks in West Africa

Source of Support: NIH

Total Award Amount: $7,307,869.00 Total Award Period Covered: 03/01/2020 - 02/28/2025

Location of Project: Global

Person-Months Per Year Committed to the Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Patrick Dawson

Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 0.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

NSF Form 1239 (10/99)

USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Wail Hayajneh	Other agencies (including NSF) to which this proposal has: none

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity (current proposal)

Source of Support: DTRA

Total Award Amount: $4,975,681.29 Total Award Period Covered: 01/01/2020 – 12/31/2024

Location of Project: USA, Jordan

Person-Months Per Year Committed to the Cal: 1.0 Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Antimicrobial Testing Leadership and Surveillance (ATLAS)

Source of Support: Pfizer

Total Award Amount: $25,000 Total Award Period Covered: 02/01/2018 – 01/31/2019

Location of Project: Global

Person-Months Per Year Committed to the Cal: 3.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

References

1. Ministry of Health. *Jordan Pandemic Influenza Preparedness and Response Plan.* 2017.
2. World Health Organization. *Joint External Evaluation of IHR Core Capacities of the Hashemite Kingdom of Jordan.* Geneva. 2016.
3. Kelly-Cirino C, Mazzola LT, Chua A, Oxenford CJ, Van Kerkhove MD. An updated roadmap for MERS-CoV research and product development: focus on diagnostics. *BMJ Glob Health.* 2019;4(Suppl 2):e001105.
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FACILITIES, EQUIPMENT, AND OTHER RESOURCES

EcoHealth Alliance, New York, United States

EcoHealth Alliance is an US-based NGO that specializes in scientific research on the causes, origins and spread of zoonotic emerging diseases. EcoHealth Alliance scientists have been conducting field research on infectious zoonotic diseases for over three decades. EcoHealth Alliance is based in New York City with 10,000 square feet of office space including a meeting room and basic laboratory – freezer storage and light microscopy. The scientific staff (15 core scientists, 100+ field staff) is supported by a core admin staff of 11, which is available for work on this project and is also funded through private individual and foundation support.

EcoHealth Alliance is equipped with 25 networked computers (PCs and Macs) including ARRA funded International LifeSize Video Conferencing facilities, and high-speed video conferencing facilities have been installed with key international collaborators. EcoHealth Alliance has access to a 24-7 server, server support, and all required software including ArcGIS, MatLab, SPSS, Microsoft Office, and Adobe CS3 running on both Apple and Windows Operating Systems. Additionally, we have a four-processor, public IP addressed Linux server which can be used for intensive computational modeling and database processing by all the grantees.

EcoHealth Alliance is the headquarters of two networks that provide exceptional leverage for the core scientists: 1) The EcoHealth Alliance Local Conservation Partners: A global partnership of 15 NGOs in Asia (including Bangladesh, India, and China), Africa and Latin America (including Argentina and Brazil). This network provides access to fieldwork in countries (such as India) that are often difficult to work in, and obtain samples from; 2) The Consortium for Conservation Medicine: A unique collaborative institution linking Johns Hopkins Bloomberg School of Public Health, Tufts University School of Veterinary Medicine Center for Conservation Medicine, The University of Pittsburgh Graduate School of Public Health, The University of Wisconsin-Madison Nelson Institute for Environmental Studies, The USGS National Wildlife Health Center, and EcoHealth Alliance. The CCM provides access to hundreds of high caliber scientists, their facilities, and their students at 6 leading institutes of public health, veterinary medicine, and environmental science in the USA.

Jordan University of Science and Technology, Irbid, Jordan

The Faculty of Veterinary Medicine at JUST is the only veterinary school in Jordan. It was established in1998 by Royal Decree. The Faculty consists of 3 different departments; Clinical sciences, basic sciences, and pathology and public health. There are several teaching and research laboratories in the Faculty. The Faculty is the home of several PhD holders and board-certified clinicians. The Basic Science Department is the home of a state-of-the-art Molecular Biology and Virology Laboratory which is the only laboratory of its kind in Jordan. The laboratory is well equipped and implements many molecular and diagnostic assays by a group of well-trained national scientists, young graduate students and technicians according to the latest scientific standards. Highly advanced molecular diagnostic assays such as cloning into TOPO vector, preparing PCR products for sequencing, and sequence analysis are performed routinely in this laboratory. In Jordan, the JUST Molecular Biology and Virology Laboratory is now considered an important hub for training and preparing future scientists with many graduate

students now being trained in the lab to perform techniques from sample handling to DNA extraction, cDNA synthesis, performing PCR protocols, cloning, plasmid purification, and genetic sequencing analysis.

The Faculty is also the home of the Veterinary Health Center (VHC). It is the only veterinary teaching clinic in Jordan. At the VHC, the veterinary Diagnostic Laboratory is equipped with various state of the art tools that enable it to perform all needed diagnostic and research tests. The laboratory is equipped with hematology, clinical chemistry analyzers, PCR machines, ELISA readers. The laboratory is also able to perform basic bacteriology tests such as bacterial culture, identification and sensitivity tests.

Human Link, Hazmieh, Lebanon
Human Link is a Lebanese-based non-governmental organization, founded in 2014 by a multidisciplinary team of scientists and experts in the fields of human development, engineering, and public health, with a common goal of "research advancing knowledge." Human Link's mission is to design and conduct scientific research and projects in the fields of bio-medicine, public health, environment, economy, and human development aimed at improving global knowledge and enhancing local population livelihoods. Human Link adopts the One-Health philosophy that links human, animal, and environmental health. At the heart of this philosophy is the notion that a healthy environment leads to healthier humans and healthier animals. It aims at reducing the burden of diseases affecting humans through unhealthy animals and unhealthy environment. At the same time, it aims at reducing the burden on the environment exerted by humans and animals.

Dr. Ghazi Kayali, CEO of Human Link, oversees two virology laboratories, one in Egypt and one in Lebanon. Human Link has exclusive use of 2160 sq. ft. of contiguous laboratory and office space in the newly completed Advanced Science building at the National Research Centre in Egypt and 2000 sq. ft. in contiguous laboratory and office space in Lebanon. A 120 sq. ft. office adjoins the laboratory, used exclusively by Dr. Kayali, and a 120 Sq. ft. office for a Secretarial Assistant.

The team includes 1 lab director, 1 postdoc, 1 research assistant, 9 graduate students, 7 field veterinarians, 4 zoologists, 4 field clinicians, and 19 field nurses working on various surveillance, cohort, and laboratory studies. All personnel have institutional laptops connected to shared cloud-based work space. PCR stations, gel documentation systems, and a DNA quantification machine, etc. are operated by connected laptops.

The laboratory in Egypt includes a dedicated tissue culture facility with 2 laminar flow hoods. The main laboratory contains benches for 12 workers, 1 fume hood, 1 fluorescence microscope, 1 inverted light microscope, 3 sinks, a de-ionized water system, a class 3 glove box, a laminar flow hood, 3 -80 freezers, 6 -20 freezers, 5 refrigerators, 5 thermal cyclers, 2 real-time PCR machines, 1 nano-drop, 2 gel documentation systems, and all necessary small laboratory equipment. The laboratory also has access to shared Ion torrent and Illumina MiSeq sequencers.

The laboratory in Lebanon includes a dedicated tissue culture facility, dedicated dark room, and dedicated PCR preparation room. The main laboratory contains benches for 24 workers and

trainees, 1 fume hood, 3 sinks, 1 -80 freezer, 1 -20 freezer, 1 refrigerator, 1 thermal cycler, 1 real-time PCR machine, 1 gel documentation system, and all necessary small laboratory equipment.

Dr. Kayali is part of the NIAID CEIRS network, USAID PREDICT network, and DTRA/GCRF CANARIES network. This enhances the work environment and provides access to additional expertise in virology, epidemiology, modeling, and genomics. Dr. Kayali also holds an adjunct assistant professor position at the department of Epidemiology, Genetics, and Environmental Sciences at the University of Texas School of Public Health.

ATTACHMENT 3 SUPPORTING DOCUMENTATION

1. FOREIGN PRINCIPLE INVESTIGATORS AND OTHER MEMBERS OF FOREIGN RESEARCH TEAM

Foreign PI:
None

Foreign Co-I:
Ehab A. Abu-Basha, PhD, MSc, DVM
Vice President, Medical Network of Establishments for Veterinary Education, Jordan

Ghazi Kayali, PhD, MPH, BS
Chief Executive Officer, Human Link, Lebanon

Other members (alphabetical order):
Mustafa Ababneh, PhD, BS
Faculty, Department of Basic Medical Sciences, Jordan University of Science and Technology, Jordan

Bilal Abduh Al Omari, BSc
Supervisor of the Diagnostic Laboratory, Veterinary Health Center, Jordan University of Science and Technology

Moh'd Borhan Al-Zghoul, PhD, MS, BS
Vice Dean, Department of Basic Medical Veterinary Sciences, Jordan University of Science and Technology, Jordan

Wail Hayajneh, MBBS
Chairman, Infectious Diseases Committee, Jordan Food and Drug Administration, Jordan

Zaidoun Saleh Hijazeen, MS, BS
National Consultant, Food and Agriculture Organization of the United Nations, Jordan

Zuhair Bani Ismail, BS
Professor, Dept. of Clinical Veterinary Medical Sciences, Jordan University of Science and Technology, Jordan

Hani A. M. Talafha, MS, BS
Director of Research Services and Lecturer, Jordan University of Science and Technology, Jordan

2. DESCRIPTION OF RELATIONSHIP BETWEEN PROJECT AND CURRENT RESEARCH EFFORTS OF FOREIGN RESEARCH TEAM

Foreign Co-Investigator Dr. Ehab Abu-Basha is a professor at the Jordan University of Science and Technology (JUST) and former Dean of the School of Veterinary Medicine. He and the additional collaborators from JUST were the first to identify MERS-CoV in camels in Jordan during work with the USAID Emerging Pandemic Threats (EPT) program in coordination with PI Karesh and EcoHealth Alliance (EHA). Co-I Abu-Basha served as the Country Coordinator over the previous 3 years for the EHA/JUST implemented USAID EPT PREDICT project lead by PI Karesh and managed by Co-I Dawson from EHA and now at US CDC but participating in this proposed project. The staff included in this proposal at the two JUST laboratories identified for this project (Diagnostic Laboratory-Faculty of Veterinary Medicine and the Molecular Biology and Virology lab - Faculty of Veterinary Medicine) performed PCR and serology diagnostics for influenza and coronaviruses for the USAID EPT PREDICT-2 project. JUST field teams included in this proposal performed the human and animal sampling for the USAID EPT PREDICT project and conducted the behavioral interviews required for the project. Dr. Wail Hayajneh, MBBS, is Chairman of the Jordanian Food and Drug Administration and a professor at the JUST Medical University. He served as an advisor on the USAID EPT PREDICT-2 project for the human studies components and will continue in this role for the proposed project.

Foreign Co-Investigator Dr. Ghazi Kayali, CEO of Human Link, oversees two virology laboratories, one in Egypt to be used in this project and one in Lebanon. He has exclusive use of 2160 sq. ft. of contiguous laboratory and office space in the newly completed Advanced Science building at the National Research Centre in Egypt. The Human Link team includes 1 lab director, 1 postdoc, 1 research assistant, 9 graduate students, 7 field veterinarians, 4 zoologists, 4 field clinicians, and 19 field nurses working on various surveillance, cohort, and laboratory studies. Dr. Kayali is a world-renowned subject matter expert for influenza and coronaviruses. He is part of the NIAID CEIRS network and the DTRA/GCRF CANARIES network and served as USAID PREDICT-2 project leader for Egypt over the previous 3 years for the EHA/Human Link implemented USAID EPT PREDICT project lead by PI Karesh and managed by Co-I Dawson from EHA and now at US CDC but participating in this proposed project.

Dr. Mahmoud Alhanatleh is the Chief Veterinary Officer for the Jordanian Ministry of Agriculture. He served as an advisor on the USAID EPT PREDICT-2 project for the animal studies components, hosted partner and stakeholder meetings, and oversaw the project interface with government animal health care workers in all regions of Jordan. He will continue in this role for the proposed project and serve as a liaison with the Jordanian government (see letter of support).

Dr. Wail Hayajneh is the Chairman of the Infectious Diseases Committee of the Jordanian Food and Drug Administration. He was formerly the Dean of the School of Medicine at Jordan University of Science and Technology. He is a subject matter expert on zoonotic diseases and served as an advisor on the USAID EPT PREDICT-2 project in humans. He will continue as a project advisor for the proposed project and serve as a liaison with the Jordanian government.

3. FACILITIES, EQUIPMENT, AND OTHER RESOURCES

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Dr. Kayali is part of the NIAID CEIRS network, USAID PREDICT network, and DTRA/GCRF CANARIES network. This enhances the work environment and provides access to additional expertise in virology, epidemiology, modeling, and genomics. Dr. Kayali also holds an adjunct assistant professor position at the department of Epidemiology, Genetics, and Environmental Sciences at the University of Texas School of Public Health.

4. FOREIGN PI AND KEY PERSONNEL LETTERS OF COLLABORATION

See next page.

Jordan University of Science & Technology

جامعة العلوم والتكنولوجيا الأردنية

ص.ب ٣٠٣٠ اربد ٢٢١١٠ الأردن هاتف ٧٢٠١٠٠٠ ٢٠٩٦٢ فاكس ٧٠٩٥١٢٣ ٢٠٩٦٢

Ref: الرقم:

Date: التاريخ:

الموافق:

August 18th, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Professor Ghassan Tashtoush, Dean of research, JUST

This letter signifies the Deanship of Research at Jordan University of Science and Technology (JUST) commitment to support the proposal "*Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity*".

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

JUST is a leading center of excellence in MERS-CoV research in Jordan and the wider region, with a strong regional influence and a proven track record in delivering high quality scientific research of a global standard. Prof. Ehab Abu-Basha has become a regional expert in MERS-CoV research, policy and control. Over the past two years he has been coordinating monthly Focal Point Meetings among all relevant emerging infectious diseases stakeholders in Jordan (governmental, WHO, FAO and others) to promote synergy of effort, prevent unnecessary duplication of resources or activities and to advise on policy. Prof. Wail Hayajneh, is Professor of Infectious Diseases at Medical school and he is also coordinating the Infectious Diseases group of Jordan and as such is at the forefront of MERS-CoV diagnosis, treatment, surveillance and control in Jordan. In addition to a highly qualified team of experts in the field of Virology, Avian diseases, Livestock infectious diseases that will add great value to the outcomes of this project.

This project will also build upon the considerable research and training capacity already developed at JUST. We whole heartedly endorse this proposal and the research value that it will add to Jordan and to the region.

Sincerely,

Ghassan Tashtoush, Professor and Dean of research

JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY
OFFICE OF THE DEAN OF RESEARCH
Irbid - Jordan

P.O. Box (3030) Irbid 22110 Jordan. Tel (962-2) 7201000 - Fax (962-2) 7095123

website: http://www.just.edu.jo

Human

August 14, 2019

To: DTRA C-WMD Thrust Area 6 Program

From: Ghazi Kayali PhD MPH

This letter signifies my commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity.*

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience with studying Avian Influenza and MERS CoV at the human-animal interface is directly relevant to the project objectives. I have been conducting surveillance for influenza and MERS in poultry, wild birds, swine, camels, bats, humans, cattle, and ruminants in several countries in the Middle East and Africa since 2013. Furthermore, in my capacity as a WHO EMRO consultant, I am familiar with the needs of Jordan and believe that this project will enhance the country's One Health and disease surveillance capacities.

Sincerely,

Ghazi Kayali PhD MPH

CEO, Human Link

Hazmieh, Lebanon

Office Address
Hazmieh, Said Freiha Str.
Camelia II Center, 3rd Floor
Baabda, Lebanon.

Office Lines
Tel: +961 5 45 42 52
Fax: +961 5 45 80 45

Email / Web
www.human-link.org
info@human-link.org

Centers for Disease Control and Prevention

National Center for Emerging and Zoonotic Infectious Diseases
1600 Clifton Rd., MS E-93
Atlanta GA 30329

August 22nd, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Patrick Dawson

This letter signifies my commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity*.

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

My own experience has been with working in Jordan and Egypt over the last seven years on research relating to MERS-CoV and Avian Influenza in animals and humans. Through this work I have partnered with the Jordan University of Science and Technology in Jordan and Human Link in Lebanon. Over the past four years we've developed a positive working relationship through EcoHealth Alliance that I hope to see continue. In my new role, I'll be able to stay to on in an advisory capacity at the start of the project, and assist with data analysis in Year 3.

Sincerely,

Patrick D. Dawson

Patrick Dawson, PhD, MPH
Epidemic Intelligence Service Officer
Division of High-Consequence Pathogens and Pathology
National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention (CDC)

المملكة الأردنية الهاشمية

وزارة الزراعة

الرقم .....

التاريخ .....

الموافق .....

August18th, 2019

To: DTRA C-WMD Thrust Area 6 Program
From: Dr. Mahmoud Alhanatleh, CVO, MOA- JORDAN

This letter signifies the Ministry of Agriculture commitment to support the proposal, *Reducing the Threat of Middle East Respiratory Syndrome Coronavirus (MERS) and Avian Influenza (AI) in Jordan & Strengthening Regional Disease Surveillance Capacity.*

I strongly support this project. It is designed to build on significant investment already underway in Jordan to augment country capacity for surveillance, detection, and reporting of infectious diseases both endemic and emerging. As some of these projects come to an end, it is critical that the capacity underway be maintained and advanced. This initiative will allow for that. It will also support the creation of a body of scientific knowledge about the presence of pathogens in humans and animals and their epidemiological and ecological dynamics, and the testing of important hypotheses related to the movement of pathogens between humans and animals.

Our previous experience with one health initiatives is directly relevant to the project objectives. The projects "Cross-sectional surveillance of MERS-CoV and related coronaviruses in camels in Jordan", "Enhanced Surveillance of Trans-boundary Animal Diseases in Rural Areas of Jordan Affected by the Crisis in Syria" and "PREDICT-2 Jordan" has successfully achieved there's research objectives, including developing capacity within Jordan for research, training, surveillance and control. This new collaboration will serve to further build capacity in these areas, equipping Jordan to grow as a regional hub for interdisciplinary, one health approaches to the challenges posed by emerging infectious diseases such as MERS-CoV and Avian Influenza.

We whole heartedly endorse this proposal and the added capacity it will bring to the Ministry of Agriculture in Jordan forMERS-CoV and AI research, training, surveillance, and control.

Sincerely,

Director Of
Veterinary & Animal Health
Dr. Mahmoud Al Hanatleh

Dr. Mahmoud Alhanatleh
Director of Veterinary Directorate (CVO)
OIE Delegate
MOA- JORDAN

5. PLANNED WORKSHOPS: TOPIC, IMPLEMENTER, AND TIMELINE

All trainings to be conducted in Amman or Irbid, Jordan except where noted.

Description	Participants	Timeline
Project Inception Workshop *One-day review of entire research design and anticipated outputs during kick-off meeting* • Overall research study protocol • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. FDA Min of Environ. Poultry Industry Camel "industry"	Y1 Q1
Jordan Training Workshop 1 *Three-day didactic workshop targeted to all personnel engaged with human subjects and animals at field study sites, laboratory staff and others who will handle human and animal data* • Basic Laboratory Safety Biosafety and Biosecurity • Cold Chain Implementation • Ethical Human Subjects Research • Ethical Animal Subjects Research • Safe Human Sampling • Safe Animal Sampling • Questionnaire Administration • Data Management and Storage	*Required attendance:* Project Personnel *Invited attendees:* Min. of Health Min. of Agric. FDA Min of Environ. Poultry Industry Camel "industry" Students	Y1 Q2
Training at Human Link lab at the National Research Centre, Egypt *Three-day hands on training in MERS-CoV diagnostics and advance avian influenza diagnostics with Co-I Kayali when human samples are brought from Jordan for MERS-CoV testing.*	One Jordanian project personnel and one Jordanian student	Y1 Q4
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Review of research study design • Presentation of Results from Year 1 • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y2 Q1
Regional Training Workshop 1 *Three-day didactic workshop in adherence to core principles and requirements for safe and secure sample handling and management (based on written DTRA requirements and BMBL 5th Edition Sections III-VI and current best practice standards)* • Review of research study design • Presentation of Results from Year 1 • Basic Laboratory Safety Biosafety and Biosecurity	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA	Y2 Q3

• Cold Chain Implementation • Ethical Human Subjects Research • Ethical Animal Subjects Research • Safe Human Sampling • Safe Animal Sampling • Questionnaire Administration • Data Management and Storage • Disease Reporting Procedures for OIE and WHO IHR	Min of Environ. Poultry Industry Camel "industry"	
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Review of research to date • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y3 Q1
Training at Human Link lab at the National Research Centre, Egypt *Three-day hands on training in MERS-CoV diagnostics and advance avian influenza diagnostics with Co-I Kayali when human samples are brought from Jordan for MERS-CoV testing.*	One Jordanian project personnel and one Jordanian student	Y3 Q1
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Presentation of Results from Years 1-3 • Policy recommendations • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	Y3 Q4 *Or* OY1 Q1 If option is exercised
Regional Training Workshop 2 **Laboratory techniques, Biosafety and Biosecurity** *Three-day didactic and hands-on intensive training and refresher training on Biosafety and Biosecurity* • Real-time PCR testing and analysis • Influenza Subtyping, Genomic Analysis of MERS-CoVs • Serology testing and analysis • Biosafety and Biosecurity Refresher Training	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY1 Q3
Training at Human Link lab at the National Research Centre, Egypt *Three-day hands on training in MERS-CoV diagnostics and advance avian influenza diagnostics with Co-I Kayali when human samples are brought from Jordan for MERS-CoV testing.*	One Jordanian project personnel and one Jordanian student	OY1 Q4
Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities*	Project Personnel Min. of Health	OY2 Q1

• Review of research to date • Discussion and input from partners and stakeholders	Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	
Regional Training Workshop 2 **Analyses and Surveillance, Biosafety and Biosecurity** *Three-day didactic and hands-on intensive training and refresher training on Biosafety and Biosecurity* • Geospatial Analysis • Advanced Epidemiology • One Health Disease Surveillance • Biosafety and Biosecurity Refresher Training	Project Personnel *Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY2 Q3
Threat Reduction Workshop *This three-day focused, Jordan country-level workshop will be developed and facilitated by the project team in consultation with partners and frameworks pertinent to zoonotic disease risk and impact mitigation (e.g. through World Bank, FAO, OIE, WHO, GHSA, UNDRR) to promote broader alignment and uptake.* • Targeting risk factors in production systems • Disease prevention and control strategies • Economic analysis • Multi-sectoral action plans and roadmaps	*Jordan, Lebanon, and Iraq Representatives from:* Min. of Health Min. of Agric. Jordan FDA Min of Environ. and representatives from other key sectors (e.g. disaster management, finance, industry)	OY2 Q3
Final Annual Partner/Stakeholder Meeting/Workshop *One-day review of project activities* • Presentation of all project results • Policy recommendations • Discussion and input from partners and stakeholders	Project Personnel Min. of Health Min. of Agric. Jordan FDA Min of Environ. Poultry Industry Camel "industry"	OY2 Q4

6. GUIDELINES AND PROTCOLS FOR HUMAN AND ANIMAL SUBJECTS RESEARCH

For human subjects research, our protocols will align with PREDICT protocols with which our in-country teams have been complying for three years. They will be modified to reference the specifics of this project's IRB (as opposed to PREDICT's IRB).

- 5.4 Human Syndromic Surveillance (see next page)

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Section 5.4. Human Syndromic Surveillance

Prepared by
Christine K Johnson, PREDICT Biological and Ecological Surveillance Lead, UC Davis
Karen Saylors, PREDICT Behavioral Surveillance Co-Lead, Metabiota
Corina Monagin, Metabiota

With contributions from:
Maureen Miller PREDICT Behavioral Surveillance Lead
Jason Euren, Metabiota
Ashley Lucas, Metabiota
Nicole Ureda, UC Davis
Kim Dodd, Metabiota
Brian Bird, UC Davis
David Wolking, PREDICT Operations Officer
Tracey Goldstein, PREDICT Pathogen Discovery Lead
and the PREDICT One Health Consortium

Objectives: To safely and ethically collect biological samples and data from humans in clinical settings.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

The authors assert that human surveillance and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

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Section 5.4.1. Confirmation of Knowledge

When you are familiar with the information in this guide, take the PREDICT quiz ***Section 8.4.12. Human Syndromic Surveillance***.

PREDICT team members involved in the human surveillance activities described in this guide must be familiar with PREDICT's Institutional Review Board (IRB)-approved Master Protocol and related IRB obligations and should take and pass the quiz ***Section 8.4.18. PREDICT IRB Compliance and Monitoring***.

Section 5.4.2. Ethical and Training Considerations

All PREDICT activities involving human subjects must adhere to the most up-to-date version of the Master Protocol that has been approved by the UC Davis Institutional Review Board (IRB). The Master Protocol is available online through the PREDICT Operating Procedures e-Book under "Section 5.3" (https://eidith.org/Resources/PREDICTOperatingProcedureseBook.aspx). In addition, PREDICT activities involving human subjects may only be initiated after obtaining ethical approval from country institutional review boards.

Before implementing human subjects research related activities, documentation of all necessary country approvals along with attestations of trainings and adherence to ethical standards must be provided for review to UCD, and the UCD IRB as appropriate. These include

1) documentation of local IRB/ethical approvals and all approved documents (including the consent form and human questionnaire translated into the local language and any additional introduction letters and recruitment scripts planned for use);
2) completion of CITI training for all personnel listed on the country protocol (with training events documented in EIDITH);
3) training of project staff in procedures outlined in this SOP (with training events documented in EIDITH);
4) identification and documentation of local institutional biosafety committee (IBC) requirements (if any);
5) a consultation from a local expert summarizing risks to the area; and
6) an attestation that all personnel will adhere to USA and local government federal and state regulations regarding protection of human subjects research.

A checklist with both country IRB preparation guidance and post country IRB approval procedures relating to UC Davis IRB authorization has been created to assist country teams with this process (Appendix 1). Please review this checklist when preparing your application for

country IRB submission and to guide the final UCD IRB authorization process following local IRB approval. **The UC Davis IRB must approve each country's protocol before local activities are initiated.**

Effort will be made in all recruitment, consent, sampling, and interview activities to assure potential participants that their **participation in the study is completely voluntary** and that all information shared with researchers will be kept confidential. Every effort will be made to avoid coercion and ensure the privacy, respect, dignity, and freedom of each participant.

PREDICT staff named on the country protocol must complete Collaborative Institutional Training Initiative (CITI) training in human research ethics for biomedical researchers. In addition, PREDICT staff listed in the country protocol will need to ensure proper training of hospital/clinic POC(s) in study procedures, including recruitment, enrollment, informed consent, and sample collection, to ensure compliance with our Master IRB protocol and PREDICT practices.

When the staffing and implementation plans have been established, a plan should be developed to train clinic and hospital staff on protocol procedures to ensure implementation of agreed upon study design. Consideration should be given to how information will be presented, as not every facility staff member will need to know every detail of the PREDICT plan.

Section 5.4.3. Partnerships with Participating Health Facilities

Symptomatic patients will be recruited for syndromic surveillance in collaborating health facilities that have a catchment area that includes high-risk communities and PREDICT field sites where linked animal and human samples are being collected concurrently.

Syndromic surveillance of patients presenting to health facilities is necessary to identify symptomatic individuals. In order to optimize the chances of accessing the most relevant acute symptomatic individuals presenting at health facilities, appropriate selection and engagement of health facilities is key. While each individual site will require a slightly different approach, teams can be guided by the following methodology when looking to engage and maintain relationships with their sites in each country.

Assessment of the Health Facility

After initial engagement with key personnel, teams will need to work collaboratively with health facility personnel to consider the most optimal way to engage with clinical, laboratory and professional staff. A short form to assist with initial assessment of potential partners for syndromic surveillance is attached in Appendix 2 (Health Facility Screening Form).

Understanding Patient Flow

A thorough review of patient flow from arrival at the facility to discharge should be done by country teams through scoping site visits including:

- Where do patients normally present upon arrival to the facility and who would they first come into contact with for initial screening and assessment?
- What health professionals would potentially be involved in the assessment, diagnosis and treatment of individuals presenting with syndromes of interest throughout their stay at the health facility?
- If patients are not admitted to a health facility but might require follow-up care, what are the normal follow-up and discharge procedures?
- If patients are admitted to the health facility, what service units/departments might be involved in their care and treatment?

Understanding Staffing Needs

Understanding normal daily routine of staff and diagnostic practices, and identifying point of contact(s) (POC), will ensure that PREDICT procedures fit in as seamlessly as possible into the normal clinic routine.

- What is staff workload like?
- Who is your POC(s) to help identify symptomatic individuals?
- Who is your POC(s) for recruitment of appropriate individuals?
- Who may be best suited for assisting with study procedures, including sample collection and administration of questionnaire?
- Are these POC(s) likely to be the same person or different?
- What will be the best way to engage and train staff about study procedures and protocol?
- Are clinical staff skilled in proposed sampling procedures?
- How will costs for staff time at hospitals be covered and implemented?

The team should identify how PREDICT activities will fit into hospital workflow and develop an implementation plan that will need to be agreed upon with the hospital team. Decisions will need to be made about whether current hospital staff will be assigned additional duties or whether a new staff person(s) will be hired.

A detailed implementation plan, taking into consideration the following issues, should be developed with participating hospital staff:

- What are some potential barriers to implementation?
- What level of visibility and follow-up will be appropriate to keep sites engaged for the duration of the study?
- How will you maintain clear and open communication with health facility staff?
- What is the plan if key personnel involved in implementation leave the health facility?
- How will you take into consideration any known or observed differences religious/ethnic/immigration status in targeting individuals for recruitment?
- How will you monitor for adverse events?

Section 5.4.4. Patient Recruitment in Hospitals and Clinics

PREDICT targets patients that have been recently admitted to clinics and hospitals with acute conditions that match the case definitions for undiagnosed febrile syndromes of likely viral origin. **The objective of PREDICT's testing strategy is to detect novel viruses that are causing diseases in patients without a known etiology.** PREDICT testing should not overlap or duplicate diagnostic testing already being conducted at the hospital.
In communications with clinic medical staff, clinic administration and patients who might be enrolled, it is critical to note that **PREDICT's testing strategy will not directly inform on patient diagnoses or treatment. Our testing strategy is exploratory at the community level and not designed as a point of care diagnostic platform for normative (known) diseases.**
Case definitions should be reviewed closely with hospital POC(s) in advance of study implementation to identify patients for enrollment. Patients for enrollment may be identified in the emergency room, in the ward, or in the intensive care unit of each participating clinic and hospital. The POC(s) at each location should use the **clinical case definitions below** to target potential participants. Case definitions for syndromes have been standardized with those commonly used by WHO and CDC to allow national health authorities to interpret data in an international context.

Syndromic Category Clinical Case Definitions

Surveillance should be designed to target specific syndromes as appropriate in each clinical setting. Identification of relevant syndromes for each facility should be done on a facility-by-facility basis with participating partners and facility staff. Selected syndromes should reflect 1) high priority undiagnosed syndromes with likely animal origins, and 2) the clinical caseload of the hospital or clinic so that a large number of patients with targeted syndromes can be enrolled. Additionally, targeted syndromes should take into account local needs and seek to not duplicate ongoing syndromic surveillance programs by other partners at the clinic or hospital.

In larger referral hospitals with high caseloads, enrollment of patients in the PREDICT study will most likely want to focus on the following three severe syndromes and clinical case definitions to better target individuals with potentially unknown viral pathogens of concern:

1. **Severe Acute Respiratory Illness (SARI) of unknown origin:**
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days
AND cough
AND requires hospitalization (or referral to a hospital)
AND absence of a more likely clinical explanation.

2. **Acute Encephalitis Syndrome (AES) of unknown origin:**
Acute onset of a fever (greater than or equal to 38°C or 100.4 °F) within the last 5 days
AND clinical signs consistent with meningitis, encephalitis, acute flaccid paralysis, or other

acute signs of central or peripheral neurologic dysfunction, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

3. **Hemorrhagic fever of unknown origin:**
Acute onset illness with a fever greater than or equal to 38°C (100.4 °F) within the last 5 days in a severely ill patient
AND clinical findings of bleeding or hemorrhage with no apparent cause
AND one or more of the following clinical findings: 1) severe headache, 2) muscle pain, 3) rash on the trunk within 3–4 days after rash onset, 4) vomiting, 5) diarrhea, 6) abdominal pain, or 7) pharyngitis, as documented by a physician or a health-care provider
AND absence of a more likely clinical explanation.

See also http://wwwn.cdc.gov/nndss/script/casedef.aspx?CondYrID=893&DatePub=2010-01-01

In smaller rural clinics, with limited diagnostic capabilities and lower patient caseloads, it may be appropriate to enroll a broader range of patients with suspected illness of unknown origin. In these circumstances, the following 2 clinical case definitions, for less severe and less specific syndromes, may be appropriate to target in addition to the severe syndromes targeted above.

4. **Fever of Unknown Origin (FUO):**
A temperature greater than or equal to 38°C (100.4 °F) for more than 24 hours as reported or measured by the patient or a health-care provider
AND absence of a more likely clinical explanation or failure to reach a diagnosis.

5. **Influenza-like Illness (ILI) of unknown origin**:
Acute onset of a fever greater than or equal to 38°C (100.4 °F) within the last 5 days.
AND cough
AND absence of a more likely clinical explanation.

Be sure to follow the most up-to-date version of the PREDICT Master IRB protocol with respect to all procedures, including recruitment, enrollment, inclusion, and exclusion criteria, and sample sizes.

Additional Enrollment Criteria and Considerations

PREDICT and hospital/clinic staff must take special care to ensure that patient recruitment and enrollment is not adversely impacting patients seeking medical care, or hindering patients' ability or willingness to seek medical care in any way. Recruitment and enrollment of patients should only occur after patients have established access to health services. Patient recruitment for this study should not be linked to patient intake or admission. Enrollment must be completely voluntary.

Eligible individuals should be recruited as soon as safely possible after presentation to the health facility, and after initial screening to ascertain whether patients meet the above clinical case definition, in order to maximize the utility of the biologic specimen collected. Successful recruitment of syndromic individuals will require monitoring of incoming patients to health facilities. Recruitment from health facilities involves many coordinated steps, involving coordination between PREDICT and health facility staff.

In addition to the clinical case syndromes identified above, inclusion and exclusion criteria outlined in the approved Master IRB protocol that must be applied to all PREDICT studies is reiterated below:

Additional Inclusion Criteria	***Exclusion Criteria***
1. Adults (18 years of age or greater) who provide informed consent	1. Individuals aged 18 years or older who refuse to provide informed consent, a parent or guardian of a child who refuses to provide consent on behalf of their child, or a child 12 years or older unable or unwilling to provide assent
2. Children (2 -17 years of age) * with an accompanying parent or guardian who is able to provide informed consent. Assent of children 12 years or older also required.	2. Adults unable to provide informed consent, including individuals with physiologically or medically induced cognitive impairments. **
3. Pregnant women	3. Children without an accompanying parent or guardian who is able to provide informed consent
	4. Children < 2 year of age
	5. Prisoners

**Children defined as 2-17 years unless the age of majority in a participating country differs. In these cases, the age range for children will be listed in the country specific IRB protocols.*

***Patients who are incapacitated and unable to provide informed consent may be enrolled if an appropriate patient representative (e.g., family member) is present, willing, and able to provide consent on the patient's behalf. If, in the course of study operations, such a patient become capable of providing informed consent, the patient will be directly consented.*

Section 5.4.5. Determining the Number of Patients to Enroll in Clinical Settings

Estimated sample sizes of patients approved in the Master IRB is a maximum of 1,620 in each country for syndromic surveillance activities over the course of the project. Any deviations from this total estimate will need to be reviewed and authorized by the UCD IRB (See Section 5.8.1b).

Patients meeting targeted case definitions should be enrolled systematically across the year so that the patient population is sampled across all relevant seasons. Monthly sample sizes throughout the year should reflect a consistent proportion of patients meeting targeted case definitions.

In general, patients should be enrolled using a quota system until approximately 20% of the participants are children < 18 years of age and 80% are adult. For larger hospitals and clinics, interval sampling will be implemented by selecting every N^{th} case at the site among those individuals who meet enrollment criteria. The interval should be determined by country teams based on an evaluation of the expected number of cases presenting at the site within a given year in order to best meet study design and sample size criteria. For example, in a large hospital with many patients meeting enrollment criteria, the first patient meeting criteria would be selected for study participation followed by selection of every 3^{rd} or 5^{th} individual (depending on the appropriate interval) until the maximum sample size is obtained.

Procedures for Patients in Hospitals and Clinics

Section 5.4.6. Overview of Procedures in Hospitals and Clinics

PREDICT and hospital/clinic staff should consider and make arrangements to conduct the following steps. These steps may need to be adjusted depending on the circumstances of each enrolled health facility. An overview is summarized below for ease of use in training PREDICT staff. Details for each procedure are described further below and in the IRB protocol.

Outline of Activities Involving Patients:

1. **Patient Triage and Intake**: Patients arrive at health facilities and present to patient triage and/or intake units. Clinic or hospital POC(S) will assess patient etiology as part of their normal routine. Following patient triage and intake, patients with presenting syndromes of interest will need to be actively referred to PREDICT POC(s). This active referral will deviate from the health facility staff's normal routine. Country coordinators will need to establish a protocol with the health facility staff prior to beginning recruitment and *ensure that this process does not negatively impact patient access to health services, or health facility workflow.*

2. **Administer Informed Consent**: Patients determined eligible via the Screening Form will be offered participation in PREDICT. Study staff will administer the informed consent form to interested patients. *No study procedures can be conducted without having first obtained informed consent.* Informed consent must happen in a private space and should not involve anyone other than research staff, the patient, a representative if the patient is incapacitated, an impartial witness if the participant is illiterate, and a

parent/guardian if the patient is a child. Once consented, the patient is considered an enrolled participant.

Note: The presence of clinical staff directly involved in patients' care during the consenting process should be construed as coercive. Patients may think they need to consent in order to continue receiving care. PARTICIPATION MUST BE STRICTLY VOLUNTARY.

3. **Collect PREDICT Specimens**: Once enrolled, PREDICT POC(s) will coordinate human biologic specimen collection. Samples may be taken concurrently when collecting samples for normative diagnostics or independently.

4. **Administer Human Questionnaire**: Study staff will administer the **standardized IRB approved human questionnaire to all enrolled participants** at a point in time that ensures patient privacy and is not disruptive to patient care. The human questionnaire must be administered to all patients from which a biologic specimen is collected.

   In clinical settings with critically ill patients, the full human questionnaire may not be possible or appropriate to administer. At a minimum, the "**Core Human Questionnaire" (pages 1-6 of Human Questionnaire)** and the **Human Hospital & Clinic Module** for Patients should be completed.

5. **Normative Diagnostics**: Throughout a patient's inpatient stay, a variety of normative diagnostics, if available, might be run by the health facility staff to determine patient etiology. If additional sampling procedures are conducted as part of normative diagnotics that do not overlap with PREDICT specimen types already collected, PREDICT may request that any unused or remaining diagnostic specimen types be saved from patients enrolled in the PREDICT study (such as cerebral spinal fluid, pleural fluid, etc) to expand the sample set for PREDICT testing.

   Once health facility staff obtain diagnostic results, patients' etiologies will be updated. This information can be used to prioritize samples for testing with PREDICT viral family protocols. If an etiology for fever or clinical syndromes is identified, samples from this patient are of lower priority, unless a novel viral infection is still suspected because the objective of PREDICT's testing strategy is to detect novel viruses that are causing disease in patients. PREDICT POC(s) will need to follow the inpatient progress of enrolled participants to know when etiologies are updated.

6. **Second PREDICT Serum Specimen Collected**: 7 days after the first sample collection or later, an additional serum sample (the discharge serum) should be obtained from participants when possible.

Section 5.4.7. Administering Informed Consent

Participation of human subjects in the study will be strictly voluntary and will require signed, informed consent. All consent discussions and procedures will be conducted in a private room or location with a trained staff member fluent in the local language. Only the PREDICT staff person/POC and the patient will be present during the consent process. Additionally, the patient's representative if the participant is incapacitated, an impartial witness if the participant is illiterate, and/or the patient's parent or guardian if the patient is a child, can be present during the consent process. CITI-trained PREDICT staff may occasionally observe consent procedures to ensure they are appropriately and thoroughly conducted.

All participants will be given an information sheet and consent form prior to being asked to participate in this study. Potential participants will review the information sheet and consent form with the PREDICT POC(s) and will be given time to ask questions. During the review, POC(s) will explain details of the study, including:

- Purpose of the study,
- Why they were selected,
- What will happen if they enroll in the study,
- Potential risks due to their participation,
- How their participation is beneficial to understanding viral pathogens in the community,
- That their participation is completely voluntary,
- How they can withdraw their participation at any time,
- How participation in the study will not interfere with, nor affect, their routine medical care in the health facility,
- How PREDICT testing is exploratory research, and not diagnostic, and this will not inform on patient diagnosis or treatment.
- Test results, these will not be directly communicated back to the participant

PREDICT Study staff POC(s) will review the consent form with participants, answering any questions participants have. It should be made clear to all participants that any data or information collected will be kept strictly confidential. Measures will be taken to ensure the respect, dignity, freedom, and privacy of each participant. PREDICT POC(s) involved in the enrollment and recruitment of participants must avoid coercion of any kind. The PREDICT representative conducting informed consent procedures will not enroll the participant in the study unless confident that the participant or his or her representative fully understands the study and all potential associated risks and benefits.

After reviewing the forms and discussing the study, individuals who agree to participate will sign and date two copies of the consent form, and the staff member conducting the consent discussion will also sign and date the consent forms. If the participant is a child, he or she will

be asked to provide assent to participate in the study and the patient's parent or guardian will sign and date the consent forms. If the patient is illiterate, the witness will sign and date two consent forms. If the patient is incapacitated, his or her representative will sign and date the consent forms. The patient will be given a copy of all consent documents.

Section 5.4.8. Brief Overview of PPE

Minimum PPE Required for Safe Human Specimen Collection
The minimum PPE used by healthcare professionals for human sampling should follow the CDC and other international guidelines for best practices and precautions.

The following are the minimum PPE requirements:

- Gloves
- Designated clothing (which may include gown, apron, long sleeve lab coat)
- Closed-toed shoes
- Eye protection (glasses or goggles), face mask or shield

(See the PREDICT ***Biosafety and PPE Guide (Section 4.1)*** for detailed instructions regarding PPE Use.)

Section 5.4.9. Collecting Clinical Specimens

Enrolled patients who satisfy inclusion criteria as described above (with signed consent form) will be asked to provide clinically relevant biological specimens based on clinical symptoms. To ensure patient privacy, no identifying information from patients will be stored with, or paired with, biological specimens or test results.

Patients should be enrolled with specimens and data collected within 3-5 days of onset of symptoms if possible, and not longer than 10 days after onset becase we are targeting viral etiologies. Critically, patients must have specimens collected as soon as possible after admission in order to ensure they are captured in the viremic phase and/or while they are still shedding the virus, if the illness turns out to be of viral origin. If feasible, hospitalized patients may have repeated serum samples collected at seven days after enrollment, or later before discharge.

Biological samples may only be collected by trained personnel certified by the country's authority for certification of medical professionals. All personnel collecting or handling PREDICT biological specimens must wear appropriate PPE and practice Universal Precaution procedures.

Study representatives should conduct activities in a secure location and a confidential

manner to ensure participant privacy. A barrier or private room should be utilized so that participants cannot be seen by outside observers while they are being sampled. During and immediately after sample collection, trained medical professionals and/or clinic staff will monitor specimen collection site(s) and treat any complications according to existing health facility protocols.

Summary of Clinical Specimen Types

The decisions about which specimens to collect should be based on the patient's clinical symptoms (eg. blood and oral/nasal swabs for respiratory patients;):

- 2 x Oral or Nasal or Oropharyngeal swabs - one in 500 µL VTM and one in 500 µL Trizol
- 2 x Whole blood samples - one with max of 500 µL of whole blood in 500 µL VTM and one with max of 500 µL of whole blood in 500 µL Trizol
- 2 x Serum samples - 2 x 500 µL aliquots, frozen without media
- 2 x Urogenital swab samples – one swab each in 500 µl VTM and 500 µl Trizol
  OR
  2 x Urine samples - one 500 µL urine sample each in 500 µL VTM and in 500 µL Trizol
- 2 x Rectal swabs - one swab in 500 µL VTM and one in 500 µL Trizol
  OR
  2 x Fecal samples - 0.5cc (pea size) feces in 500 µL VTM and 0.5cc (pea size) feces in 1 mL Trizol
- Additional samples or aliquots of specimens collected for standard normative diagnostic purposes by hospital staff may be requested, as appropriate and based on clinical symptoms (see below).

Whole Blood and Serum

Trained phlebotomists, doctors, or nurses will collect venous blood samples by standard venipuncture from the right or left antebrachium.

A minimum of two blood samples will be collected from each participant. Collect one sample into a vacutainer tube containing serum separator and the other into a vacutainer tube containing EDTA. For children aged 12 years or younger, collect a maximum of 6mL in each tube. From individuals aged 13 years and older, collect a maximum of 12mL per tube.

Ensure adherence to appropriate PPE while handling biological specimens.
Allow blood in the red top or serum separator tube to clot, then centrifuge. After clotting and centrifugation, aliquot a minimum of two (and up to four) 0.5 mL aliquots of serum into individual cryovials without Trizol or VTM.

From the EDTA lavender top tube, place up to 500 µL whole blood directly into 2 vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each vial well.

Samples will be frozen immediately in liquid nitrogen and then transferred to an ultralow (-80°C) freezer as soon as possible for storage until analysis.

Note that two blood sampling events are warranted if feasible in a hospital or clinic setting, one on the day of enrollment and one seven days after enrollment or later (before discharge), to collect a serum sample only. If serologic assays are available for use for targeted viruses, a rise in IgM with convalescence might assist in establishing causality with disease syndromes.

Oral, Nasal, or Oropharyngeal Swabs

Each patient may have duplicate oral, nasal, or oropharyngeal swabs collected on the day of enrollment to the study.

Oral and nasal swabs will be collected by applying a sterile, flexible, nylon-tipped swab to the appropriate tissue and gently rubbing for 2-5 seconds. Oropharyngeal swabs will be collected by medically trained personnel by gently inserting sterile, flexible, nylon-tipped swabs into the pharyngeal cavity for 2-5 seconds and rotating while removing, as is done for diagnostic procedures.

Place each swab into its own vial, one containing 500 µL VTM and one containing 500 µL of Trizol, mix each tube well, and freeze immediately.

Rectal Swab or Feces

Rectal swabs will be collected by gently inserting 2 sterile, flexible, nylon-tipped swabs into the anal canal, moving them from side to side, and rotating while removing. Place each swab into a vial, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

If patients are to provide a stool sample instead, they will be provided containers labeled with their individual ID number and instructions on how to collect an uncontaminated fecal sample, including appropriate guidelines for hand washing after sample collection.

Add 500 µL (a pea-sized piece) of feces directly into each of two vials, one containing 500 µL VTM and one containing 1ml Trizol. Mix each tube well and freeze immediately.

Urogenital Swab or Urine

A urine sample will be collected in a sterile universal container. Patients will be provided containers labeled with their unique ID numbers and instructions on how to collect an uncontaminated urine sample, including appropriate guidelines for hand washing after

sample collection.

Add up to 500 µL of urine directly into each of two vials, one containing 500 µL VTM and one containing 500 µL Trizol. Mix each tube well and freeze immediately.

If urine can't be obtained, collect two urogenital swabs and place into two vials, one containing 500 µL VTM and one containing 500 µL of Trizol. Mix each tube well and freeze immediately.

Additional Samples

For hospitalized patients, PREDICT also may receive remnants or aliquots of appropriate clinical specimens that have already been collected for diagnostic purposes. PREDICT testing should be conducted on remaining sample aliquots only after standard diagnostic procedures have been completed to ensure PREDICT activities do not interfere with patient care. These samples may include urogenital swabs, cerebral spinal fluid (CSF), pericardial fluid, pleural fluid, ocular swabs, or others. PREDICT should collect these remnants or aliquots in keeping with the respective participant's clinical symptoms, for instance, pleural fluid would be sourced from participants with respiratory distress, CSF from participants with encephalitis, etc. These samples can be frozen at −80 °C without Trizol or VTM. If additional PREDICT analyses are done on hospital diagnostic screening samples, results will not be communicated to patients or participating health facilities.

Section 5.4.10. Medical History and Behavioral Risk Data Collection in Clinical Setting

All enrolled patients will complete the required elements of the ***Human Questionnaire*** and the ***Human Hospital and Clinic Module for Patients***. If appropriate given the clinical setting and patient condition, the full PREDICT Human Questionnaire with all relevant modules can be completed.[1]

Questionnaire data will be collected by trained staff in a strictly confidential manner. Individual interviews will be conducted in private with no other individuals within a 10-foot distance, ensuring that others cannot hear the interviews. A barrier will be created so that no other individuals can view the participant while they are in their interview. Staff will take care to pair interviewers and respondents by sex to ensure protection of women and children and privacy

[1] To access the Human Questionnaire and desired module bubble forms, log in to EIDITH at https://connect.eidith.org/. Click the "Download Bubble Forms" button and select "Human Questionnaire" under the Choose Type drop-down menu. Select the Questionnaire or module you wish to download, indicate the number of forms you would like, and press "Submit." When prompted to do so, click on the word "here" to download your form/s. Additional instructions for completing and uploading the forms may be found in the Videos and Instructions menus on the connect.EIDITH.org dashboard.

and confidentiality of responses. Children will not be interviewed in the absence of a parent or guardian.

As many questions are sensitive in nature, the presence of support persons may make it difficult for participants to feel comfortable answering questions honestly. PREDICT POC(s) should liaise with clinical staff and family members for critically ill participants, as appropriate, to determine the most patient-centered means of collecting sensitive data, while still maintaining the accuracy of the data collection methods.

Where participants are intubated and unable to communicate verbally, but alert and appropriately communicative, POC(s) may administer the human questionnaire using paper and pencil with participants, if possible. Where patients are sedated and/or comatose, a shortened version of the questionnaire may be completed with a family member or substitute decision maker, if deemed appropriate by all parties. The human questionnaire must be completed if a biologic specimen is drawn; therefore, if the POC(s) is unable to complete the questionnaire for any reason with a participant, they will be excluded from the study. In all instances, the decision to complete the human questionnaire with critically ill individuals must weigh the benefits and downsides with family/friends, clinical staff, and the research team. The POC(s) must also consider patient privacy in immobile or critically ill participants and deem if there is appropriate space in which to conduct the questionnaire to ensure privacy and confidentiality.

Participants may be given a small token of appreciation for participation in the study that is appropriate with local culture and customs and valued at no more than $10 USD. Local research teams will determine the most appropriate item to give as a token of gratitude to research participants. This item should be given to participants after consent and baseline sampling and interviews are complete.

Section 5.4.11. Record Maintenance and Ensuring Participant Privacy

A study participant log should be maintained at each site to track participant enrollment. Information on new participant enrollments should be added to the log in a timely fashion after their consent; the enrollment of pregnant women and children, in particular, should be noted. If, after signing a consent form, a participant decides that they wish to withdraw from study activities, this information must be recorded in the participant log. In addition, each site may wish to maintain a confidential linking log that links participant names to their unique identification number; this log should also be maintained in an up-to-date manner, with information on study enrollees added shortly after their consent. An example participant log is attached in Appendix III.

No identifying information from patients will be stored with or paired with questionnaire data, biological specimens, or analytical test results. Further, identifying information must not be stored electronically and must be stored securely in locked drawers or cabinets in areas accessible only by PREDICT staff. When questionnaires are moved to the country headquarters,

they will contain only coded data to ensure the safety and confidentiality of participants and will be maintained in a secure database. The only document that will link the participant with a unique ID number is the consent form, which will be stored in a locked file separately from participant data in the offices of the Country Coordinator.

Section 5.4.12. Reporting Results

The PREDICT team will inform collaborating partners of the aggregate patient test and behavioral risk findings as well as provide information about viral detection and zoonotic diseases detected, as appropriate. One key benefit of this study to participating clinics and hospitals is to enhance understanding of viruses that could be causing syndromes in local people but that have previously gone undiagnosed. This information will inform participating clinics and hospitals about viruses common in target patient communities and may lead to practices that could reduce exposure and health risks.

Report summaries of interpreted data generated from the project will be provided to the Ministry of Health for approval for release. Following approval for release, report summaries from the project can be shared with other in-country collaborating investigators and hospitals. Adverse events or serious adverse events will be included in report summaries provided to Ministries of Health upon request.

Section 5.4.13. Protocol Deviations, Unanticipated Problems, and Adverse Events

For complete information on protocol deviations, unanticipated problems, and adverse events, see the PREDICT Compliance and Monitoring Guide.

Protocol Deviations
Country teams and hospital and clinic POCs responsible for conducting PREDICT surveillance activities must be familiar with PREDICT's IRB protocols and knowledgeable about expected human surveillance operations. If, during the course of study activities, a team member becomes aware that any human surveillance activities have not been conducted in accordance with protocols or training guides, the team member should promptly inform the country field coordinator/human surveillance officer (if one is active in the country) or Country Coordinator about the deviation. The Country Coordinator should promptly contact the regional lead and complete any documentation, including developing any Corrective and Protective Action plans.

Unanticipated Problems
Unanticipated problems are events that are **unexpected** and **related to the research study** and that put one or more study participants at **greater risk of harm**. Unanticipated problems can include events or issues arising during standard research operations that may not cause detectable harm or adverse effects to research participants, but nonetheless raise the level of

risk associated with research participation (e.g., stolen consent forms or linking logs; breaches of privacy during research interviews). All problems meeting the three criteria above must be reported to the Operations Officer (predict@ucdavis.edu) within 24 hours (if the unanticipated problem is serious) or 72 hours (if the problem is not serious) using the form in Appendix IV.

Adverse Events and Serious Adverse Events

It is possible that during the course of study activities, a participant may experience discomfort or distress. Certain discomforts, such as pain at the site of blood collection and discomfort answering sensitive questions, are expected and detailed in the study protocol. Additional possible risks to study participation may be identified for a given site upon consultation with a local risk expert.

If, during the course of study operations, a participant reports or exhibits one of these anticipated adverse reactions to study participation (be it physical, mental, emotional, or social), that adverse reaction, or "adverse event," should be documented and reported to the human surveillance/field coordinator (if one is active in the country) and Country Coordinator promptly, but no later than within five working days (see the Reportable Information, Unanticipated Problem, and Adverse Event Reporting Form, Appendix IV). Once the Country Coordinator learns of the Adverse Event, he or she should report it to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) within **72 hours**.

In the event a participant reports or exhibits a ***serious*** adverse event that is ***unexpected,*** that is likely ***related*** to study activities, and that implies the ***level of risk to all study participants may be higher than previously expected***, that serious adverse event should be reported to the human surveillance/field coordinator (if one is active in the country) or Country Coordinator within five working days. The human surveillance/field coordinator should report the event to the Country Coordinator, and the Country Coordinator should report the event to the Lead PREDICT PI (Dr. Mazet) and Operations Officer (predict@ucdavis.edu) **within 24 hours**.

The Lead PREDICT PI and Operations Officer are responsible for notifying the UCD IRB within the same time frame (72 hours for adverse events; 24 hours for serious adverse events). The Country Coordinator should report these adverse events to the in-country IRB or ethical committee if and as required to do so.

After becoming aware of any adverse event, the Country Coordinator should confer with their regional lead, the PREDICT global team, and relevant IRBs/ethical boards to determine what steps, if any, should be taken to address the adverse event and prevent similar future events.

Section 5.4.14. Site Monitoring

Each in-country team should work together in the first year to implement key procedures from the PREDICT IRB Compliance and Monitoring Guide on site monitoring and reporting (summarized in Appendix 5). Country Coordinators will be expected to work with PREDICT POCs at hospital and clinic sites to develop a regular system for transferring key study documents, reviewing records for completion, and addressing issues or concerns that arise during study activities.

As part of monitoring and reporting plans, at the completion of each surveillance period, generally on a calendar year schedule, a data and safety review will be conducted by a representative of the PREDICT global or regional management team. At this review, safety information and adverse events collected during the performance period will be discussed and addressed. Data may include case report forms, notes from study visits, and or any telephone calls to the PI from participants.

Section 5.4.15. References

CDC – Guideline for Isolation Precautions 2007. Healthcare Infection Control Practices Advisory Committee. Retrieved from:
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WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization; 2010. 2, Best practices in phlebotomy. Retrieved from
http://www.ncbi.nlm.nih.gov/books/NBK138665/http://www.ncbi.nlm.nih.gov/books/NBK138665/

Influenza Specimen Collection, U.S. Department of Human and Health Services, Centers for Disease Control and Prevention. Retrieved from
http://www.cdc.gov/flu/pdf/freeresources/healthcare/flu-specimen-collection-guide.pdf

Section 5.4.16. Appendix I. PREDICT IRB Checklist for UC Davis Submission

Before initiating human surveillance activities described in the Master Protocol, the following items must be submitted to the PREDICT Global Team via predict@ucdavis.edu prior to submission to local IRBs or ethical committees. The Global Team will conduct a rapid internal review of these documents to ensure plans comply with project objectives and global IRB approvals.

Following local IRB or ethics committee approval, additional materials must also be shared with the Global Team to forward onto the UC Davis IRB for final review and approval of country activities.

The most current drafts of global IRB-approved documents, including the currently approved protocols, consent forms, and questionnaires, are available at: http://eidith.org/Resources/PREDICTIRBProtocols.aspx (EIDITH login required).

Submission Checklist:

☐ 1. Submitted a bulleted list of changes made to all global document(s) to predict@ucdavis.edu.

☐ 2. Shared the country plan developed on the PREDICT global protocol template (using Track Changes as descried in the instructions) with predict@ucdavis.edu.

☐ 3. Used the most recent version of the Master Protocol documents (available at http://eidith.org/Resources/PREDICTIRBProtocols.aspx) to develop in-country materials.

☐ 4. Submitted English language versions of the country protocol, written consent form, verbal consent form, introductory script, and human questionnaire (Word.doc preferred) to predict@ucdavis.edu. Provided English language versions of any printed advertising materials to predict@ucdavis.edu.

☐ 5. Provided in-country IRB submission requirements (in copy or by web link, or if not in English via a document explaining the requirements) to predict@ucdavis.edu.

☐ 6. Clearly listed all Country Coordinators, Human Surveillance Coordinators, Global Leads, and key US-based staff involved in the study in the country protocol personnel list. These individuals will require CITI training.

Following Country-Level Approval – The Post-Submission Checklist:

☐ 1. Submitted all documentation of local IRB/ethical approvals to predict@ucdavis.edu. *All countries to submit this documentation.*

☐ 2. Provided all translated documents to predict@ucdavis.edu. For countries using town hall recruitment methods, this includes (a) translated study introduction letter(s) and recruitment script(s).

☐ 3. Submitted CITI training certificates for all personnel listed in the country protocol to predict@ucdavis.edu and entered all CITI training events to the EIDITH training app for monitoring (EIDITH app: http://training.eidith.org).

☐ 4. Trained all members of the human subject research team (training conducted by CITI-certified personnel) in human research ethics, and entered documentation of training events into the EIDITH training app (http://training.eidith.org). *Please maintain a record of all personnel involved in the study to allow monitoring of training status via the EIDITH Training Dashboard.*

☐ 5. Trained all relevant staff in PREDICT biological specimen safety protocols and entered documentation of all training events into the EIDITH training app (http://training.eidith.org). In addition, identified all local requirements for biological specimen safety (if any) and communicated requirements with study staff.

☐ 6. Identified and addressed local IBC requirements (if any) and shared a document outlining these requirements with predict@ucdavis.edu.

☐ 7. Conducted a consultation with a local expert on risks of human subject research in the study area; communicated these risks to the global and human surveillance teams for consideration.

☐ 8. Submitted a signed attestation form to predict@ucdavis.edu (see instructions) indicating that all personnel will adhere to all US federal and state regulations related to the protection of human research subjects.

Section 5.4.17. Appendix II. Health Facility Screening Form

Health Facility Screening Form

Facility Description

Type of Facility:
- ☐ Clinic
- ☐ Hospital
- ☐ Other_____

On-Site Facilities:
- ☐ Inpatient Unit (_____ beds)
- ☐ Emergency Department (_____ beds)
- ☐ Intensive Care Unit (_____ beds)

Facility Operating Hours:

Sunday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Monday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Tuesday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Wednesday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Thursday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Friday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs
Saturday	☐ Closed	☐ 24-Hrs	☐ ____ Hrs

Facility Departments:
- ☐ Chemistry Lab
- ☐ Microbiology Lab
- ☐ Radiology Department
  - ☐ CT Scanner
  - ☐ MRI Machine
  - ☐ Ultrasound Machine
  - ☐ X-ray Machine
- ☐ Transfusion Medicine Department

Direct Disease Reporting:
- ☐ Regional Reporting
- ☐ Country Reporting
- ☐ International Reporting

On-Site Personnel:
- ☐ Physicians (_____ staff)
- ☐ Nurses (_____ staff)
- ☐ Infectious Disease (_____ staff)
- ☐ Phlebotomy Team (_____ staff)

Health Care System

Coverage of Care:
- ☐ Fixed-Cost for Patients
- ☐ Sliding-Scale for Patients
- ☐ Free for Patients
- ☐ Supplemented Only if Patient has Private Insurance
- ☐ Location-Specific

Patients Served

Geographic Areas Served by Medical Facility:
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Presentation of Syndromes of Interest (Last Month):
- ☐ Fever of Unknown Origin (_____ patients)
- ☐ Fever with Rash (_____patients)
- ☐ Fever with Diarrhea (_____patients)
- ☐ ILI/SARI (_____patients)
- ☐ Encephalitis (_____patients)
- ☐ Hemorrhage (_____patients)

Diagnostics

Health Facility Screening Form

Normative Diagnostics:

Chikungunya	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Cholera	☐ On-Site Rapid	☐ Stool Culture	☐ Off-Site	☐ None
Dengue	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Hantavirus	☐ On-Site Rapid	☐ Serology Testing	☐ Off-Site	☐ None
Influenza	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Japanese Encephalitis	☐ On-Site Rapid	☐ Cerebrospinal ELISA Test	☐ Off-Site	☐ None
Malaria	☐ On-Site Rapid	☐ Microscopic Examination	☐ Off-Site	☐ None
Tuberculosis	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Typhoid	☐ On-Site Rapid	☐ Culture	☐ Off-Site	☐ None
Yellow Fever	☐ On-Site Rapid	☐ PRNT Test	☐ Off-Site	☐ None

If Off-Site, Where?_____

Specimen Collection Capability

Fluid Collection
- ☐ Blood Sample
- ☐ Fecal Sample
- ☐ Urine Sample

Mucosal Collection
- ☐ Nasal Swab
- ☐ Nasopharyngeal Swab
- ☐ Oropharyngeal Swab
- ☐ Anal Swab

Other Samples
- ☐ Ocular Swab
- ☐ Sputum Sample
- ☐ Cerebrospinal Fluid
- ☐ Pericardial Fluid
- ☐ Pleural Fluid

Patient Care

Referral Process:

Are Patients Ever Referred Out for Care?
☐ No ☐ Yes (where: _____)

If Yes, Is There Active Patient Follow-Up?
☐ No ☐ Yes

Patient Health Records:
- ☐ Paper
- ☐ Electronic

Research Capacity

Experience with Research:

Facility Actively Conducts Research
☐ No ☐ Yes

Facility Collaborates with External Researchers
☐ No ☐ Yes

On-Site Cold Storage:
- ☐ Refrigerator (4C)
- ☐ Freezer (-20C)
- ☐ Deep Freezer (-80C)

Section 5.4.18. Appendix III Sample PREDICT Participant Enrollment Log

Participant ID Number	Consent / Enrollment Date	Pregnant Woman? (Y/N)*	Child / Minor? (Y/N)*	Date Human Questionnaire Completed	Biological Samples Provided? (Y/N)	Ethnographic Interview? (If Yes, date)	Focus Group? (if Yes, date)	Withdrawn consent? (Y/N)	Withdrawn due to AE?** (Y/N)

*If a participant is **both** pregnant **and** a minor, they should be marked in the child/minor category **ONLY**
**AE – Adverse Event

Enrollment Log Page Number _____

Section 5.4.19. Appendix IV PREDICT Reportable Information, Unanticipated Problem, and Adverse Event Reporting Form

Form is embedded in PDF document (pp. 26a and 26b, below) and available as a standalone document in the PREDICT EIDITH online Operating Procedures EBook.

USAID | PREDICT
FROM THE AMERICAN PEOPLE

PREDICT Reportable Information, Unanticipated Problem, & Adverse Event Reporting Form

Reportable information (RI), unanticipated problems (UPs), adverse events (AEs), and serious adverse events (SAEs) arising in the course of PREDICT operations must be documented and reported to PREDICT Global staff at UC Davis. These reports help PREDICT and ethical review boards ensure that study participation does not pose unacceptable levels of risk to participants. This form should be used to report one instance of reportable information, one unanticipated problem, or one adverse event. The form may also be used to provide new, additional information on an existing report.

If providing new information on an existing report, please reference the date and provide a brief description of the previous report.

Please report all RI, UPs, AEs, and SAEs to your c ountry coordinator within THREE (3) business days if the event is not serious and ONE (1) day if the event is serious (see reverse for definitions).

Country coordinators should report RI, UPs, AEs, and SAEs to within THREE (3) days (if not serious) or ONE (1) day (if serious).

1. The report following describes (please check all that apply)

☐ Reportable Information ☐ an Unanticipated Problem ☐ an Adverse Event

☐ New information from a previous report.

Original report date: _____

2. Date of report: _____

3. Date(s) of event: _____

4. Date of event discovery: _____

5. Please provide a brief description of the event:

6. Did any of the following occur? (Check all that apply)

- ☐ Non-compliance with IRB requirements or determinations, or allegations of such non-compliance*
- ☐ Protocol deviation due to the action or inaction of the investigator or research staff*
- ☐ Breach of confidentiality*
- ☐ Death of participant
- ☐ Event is life threatening/places the subject at immediate risk of death
- ☐ Inpatient hospitalization or prolongation of existing hospitalization
- ☐ Persistent or significant disability/incapacity
- ☐ Congenital anomaly/birth defect
- ☐ Subject's health in jeopardy; may require medical, counseling, or surgical intervention to prevent one of the other outcomes listed above
- ☐ Criminal or civil liability or damage to the subject's financial standing, employability, or reputation.

7. Relatedness to study procedures, by principal investigator (PI) determination (Please select one)

- ☐ Unrelated: cause of problem is known; problem is not related to study procedures
- ☐ Possibly related: Less than likely (≤ 50%) chance of relatedness to study procedures; relation to study procedures is unclear but cannot be ruled out.
- ☐ Probably related: More than likely (≥ 50%) chance of relatedness to study procedures;
- ☐ Definitely related to study procedures: clear association in time with study procedures; no likely alternative cause

8. Outcome

- ☐ Resolved with no further problem/complaint
- ☐ Resolved with additional problem/complaint
- ☐ Hospitalization
- ☐ Death
- ☐ Unresolved at time of study close-out

Definitions:

Reportable Information includes **any new information that indicates the rights, safety, or welfare of participants or others has been or may be compromised** by something that occurred or did not occur in relation to study activities. Reportable information may include (but is not limited to) protocol deviations, participant complaints, safety monitoring reports, and changes to research conditions that pose safety risks.

Unanticipated problems are problems that are **unexpected**, that are **related or probably related** to the study, and that suggest research participation involves a **higher level of risk than was previously anticipated.**

Unexpected means that the **nature**, **severity**, and/or **frequency of the problem was not anticipated** given the study population and the nature of the IRB-approved study procedures. In reference to an AE, "unexpected" means that the nature, severity, or frequency of the problem is inconsistent with the natural progression of any underlying disease, disorder, or condition that the subject may have or with the participant's predisposing risk factor profile for the AE.

Adverse events are any **unfavorable occurrences** (including physical, mental, emotional, and social) that the participant experiences during or as a result of study activities.

*Requires additional completion and submission of a Corrective and Preventive Action (CAPA) Plan.

Signature_____ Date _____

Section 5.4.20. Appendix V. IRB Compliance Responsibilities and Expectations

(PENDING)

- Sample of a human survey questionnaire: Camel Exposure Module – English (see next page)

Camel Exposure Module – English

STUDY ID: _____

Q1. Have you taken this questionnaire in the past?

◯ NEVER
◯ YES – IN 2018 AT THIS LOCATION
◯ YES – IN 2018 AT A DIFFERENT LOCATION
◯ YES – IN 2017 AT THIS LOCATION
◯ YES – IN 2017 AT A DIFFERENT LOCATION

INTERVIEWER SCRIPT
We will now ask you about recent illnesses you may have had, any hospitals you may have visited recently, different interactions you may have had with camels, and what you think about camels and health.

Q2: Do you feel sick today?

◯ YES ◯ NO

Q3: Do you have a cough today?

◯ YES ◯ NO

Q4: Do you feel like you have a fever today?

◯ YES ◯ NO

IF Q2 OR Q3 OR Q4 = "YES" SKIP TO Q6.

⇨ **Q5: Have you felt sick, had a cough, or had a fever recently?**

◯ NO
◯ IN THE LAST 3 DAYS
◯ IN THE LAST 7 DAYS
◯ IN THE LAST 14 DAYS
◯ IN THE LAST MONTH

IF Q2 & Q3 & Q4 & Q5 = "NO" SKIP TO Q11.
IF Q2 & Q3 & Q4 = "NO" & Q5 ≠ "NO" SKIP TO Q7.

⇨ **Q6. For how many days have you felt sick or had a cough or fever?**

_____ FILL IN NUMBER OF DAYS

IF Q6 IS ANSWERED SKIP TO Q8.

⇨ **Q7. How many days in total did you feel sick or have a cough or fever?**

_____ FILL IN NUMBER OF DAYS

⇨ **Q8. Have you been seen by a doctor or nurse for this condition?**

◯ YES ◯ NO

IF Q8 = "YES" SKIP TO Q10.

⇨ **Q9. Do you plan to be seen by a doctor or nurse for this condition?**

◯ YES ◯ NO

↳ IF Q8 & Q9 = "NO" SKIP TO Q11.

⇨ **Q10. Where did you go or where will you go to see a doctor or nurse for this condition?**

◯ FRIEND OR FAMILY MEMBER WHO IS A DOCTOR OR NURSE
◯ PRIVATE DOCTOR OR NURSE
◯ CLINIC ◯ HOSPITAL ◯ OTHER_____

Q11. When was your most recent illness involving a fever or cough:

◯ NEVER
◯ IN THE PAST MONTH ◯ IN THE PAST 3 MONTHS
◯ IN THE PAST 6 MONTHS ◯ IN THE PAST YEAR
◯ IN THE PAST 2 YEARS ◯ MORE THAN 2 YEARS AGO

↳ IF Q11 = "IN THE PAST MONTH" CHECK THAT Q5 DOES NOT SAY "NO".

Q12. When is the most recent time you have been in a hospital?

◯ I HAVE NEVER BEEN IN A HOSPITAL
◯ IN THE PAST 14 DAYS ◯ IN THE PAST MONTH
◯ IN THE PAST 3 MONTHS ◯ IN THE PAST 6 MONTHS
◯ IN THE PAST YEAR ◯ IN THE PAST 2 YEARS
◯ MORE THAN 2 YEARS AGO

↳ IF Q12 = "I HAVE NEVER BEEN IN A HOSPITAL" SKIP TO Q14.

⇨ **Q13. During your most recent visit to a hospital, what was the main purpose of your visit?**

◯ I WAS A PATIENT ◯ I WAS VISITING A PATIENT
◯ I WORK AT THE HOSPITAL ◯ I WAS VISITING A HOSPITAL WORKER
◯ OTHER_____

INTERVIEWER SCRIPT
Camels are an important part of Jordanian culture, and many people use camels or camel products such as milk in their daily life. We will now ask you about a number of different ways in which you might interact with camels or use camel products in Jordan.

Q14. In a typical week for you, how many camels do you see?

◯ 0 ◯ 1 ◯ 2-5 ◯ 6-10 ◯ 11-20 ◯ 21-50
◯ 51-100 ◯ 101-500 ◯ MORE THAN 500

Q15. In a typical week for you, how many camels are ever within a distance of 1 meter from you? *Interviewer should point to someone or something approximately 1 meter away from the participant to indicate the distance.*

◯ 0 ◯ 1 ◯ 2-5 ◯ 6-10 ◯ 11-20 ◯ 21-50
◯ 51-100 ◯ 101-500 ◯ MORE THAN 500

Q16. Do you drink camel milk?

◯ NEVER
◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q16 = "NEVER" SKIP TO Q19.

⇨ **Q17. Thinking about the last time you drank camel milk; did you or someone else boil the camel milk before you started drinking it?**

◯ YES ◯ NO

IF Q17 = "YES" SKIP TO Q19.

⇨ **Q18. Have you or someone else ever boiled camel milk before you started drinking it?**

◯ YES ◯ NO

Q19. Do you drink camel urine?

◯ NEVER
◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q19 = "NEVER" SKIP TO Q22.

⇨ **Q20. Thinking about the last time you drank camel urine; did you or someone else boil the camel urine before you started drinking it?**

◯ YES ◯ NO

IF Q20 = "YES" SKIP TO Q22.

⇨ **Q21. Have you or someone else ever boiled camel urine before you started drinking it?**

◯ YES ◯ NO

Q22. Do you apply camel urine topically onto your skin?

◯ NEVER
◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q22 = "NEVER" SKIP TO Q25.

⇨ **Q23. Have you ever put camel urine on your skin and it came into contact with any scratches, cuts, abrasions, or open wounds on your skin?**

◯ YES ◯ NO

⇨ **Q24. Have you ever put camel urine on your face?**

◯ YES ◯ NO

Q25. Do you eat camel meat?

◯ NEVER
◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

IF Q25 = "NEVER" SKIP TO Q28.

⇨ **Q26. Thinking about the last time you ate camel meat; was it uncooked/raw?**

◯ YES ◯ NO

IF Q26 = "YES" SKIP TO Q28.

⇨ **Q27. Have you ever consumed uncooked/raw camel meat?**

◯ YES ◯ NO

Q28. Have you ever been inside an area where camels are raised, held, quarantined, slaughtered, or butchered?

◯ YES ◯ NO

IF Q28 = "NO" SKIP TO Q30.

⇨ **Q29. How often are you inside an area where camels are raised, held, quarantined, slaughtered, or butchered?**

◯ ONCE A DAY OR MORE
◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE
◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q30. Have you ever touched an adult camel with your hands?

◯ YES ◯ NO

IF Q30 = "NO" SKIP TO Q32.

⇨ **Q31. How often do you touch an adult camel with your hands?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q32. Have you ever touched a camel calf (baby or young camel) with your hands?

◯ YES ◯ NO

IF Q32 = "NO" SKIP TO Q34.

⇨ **Q33. How often do you touch a camel calf (baby or young camel) with your hands?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q34. Have you ever kissed a camel on its face?

◯ YES ◯ NO

IF Q34 = "NO" SKIP TO Q36.

⇨ **Q35. How often do you kiss a camel on its face?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q36. Have you ever milked a camel?

◯ YES ◯ NO

IF Q36 = "NO" SKIP TO Q38.

⇨ **Q37. How often do you milk a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q38. Have you ever slaughtered or butchered a camel?

◯ YES ◯ NO

IF Q38 = "NO" SKIP TO Q40.

⇨ **Q39. How often do you slaughter or butcher a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q40. Have you ever touched a camel's blood?

◯ YES ◯ NO

IF Q40 = "NO" SKIP TO Q42.

⇨ **Q41. How often do you touch a camel's blood?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q42. Has a camel ever sneezed or spit on you?

◯ YES ◯ NO

IF Q42 = "NO" SKIP TO Q44.

⇨ **Q43. How often does a camel sneeze or spit on you?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q44. Have you ever cleaned a pen, holding area, stable, farm grounds, living area, or quarantine for camels?

◯ YES ◯ NO

IF Q44 = "NO" SKIP TO Q47.

⇨ **Q45. How often do you clean a pen, holding area, stable, farm grounds, living area, or quarantine for camels?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

⇨ **Q46. Thinking about the last time you were cleaning a pen, holding area, stable, farm grounds, living area, or quarantine for camels, were camels physically present during your work?**

◯ YES ◯ NO

Q47. Have you ever been bitten or scratched by a camel?

◯ YES ◯ NO

IF Q47 = "NO" SKIP TO Q49.

⇨ **Q48. How often are you bit or scratched by a camel?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q49. Have you ever been within 1 meter of a camel that has nasal discharge? *Interviewer should show an image of nasal discharge in a camel and point to someone or something approximately 1 meter away from the participant to indicate the distance.*

◯ YES ◯ NO

IF Q49 = "NO" SKIP TO Q51.

⇨ **Q50. How often are you within 1 meter of a camel that has nasal discharge?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q51. Have you ever stepped on, sat on, or touched a surface where fresh camel feces are frequently present?

◯ YES ◯ NO

IF Q51 = "NO" SKIP TO Q53.

⇨ **Q52. How often do you step on, sit on, or touch a surface where fresh camel feces are frequently present?**

◯ ONCE A DAY OR MORE ◯ ONCE A WEEK OR MORE
◯ ONCE A MONTH OR MORE ◯ ONCE A YEAR OR MORE
◯ LESS THAN ONCE A YEAR

Q53. Have you ever stepped on, sat on, or touched a surface where fresh camel urine is frequently present?

◯ YES ◯ NO

IF Q53 = "NO" SKIP TO Q55.

⇨ **Q54. How often do you step on, sit on, or touch a surface where fresh camel urine is frequently present?**

- ○ ONCE A DAY OR MORE
- ○ ONCE A WEEK OR MORE
- ○ ONCE A MONTH OR MORE
- ○ ONCE A YEAR OR MORE
- ○ LESS THAN ONCE A YEAR

Q55. Have you ever stepped on, sat on, or touched a surface where fresh camel blood is frequently present?

○ YES ○ NO

IF Q55 = "NO" SKIP TO Q57.

⇨ **Q56. How often do you step on, sit on, or touch a surface where fresh camel blood is frequently present?**

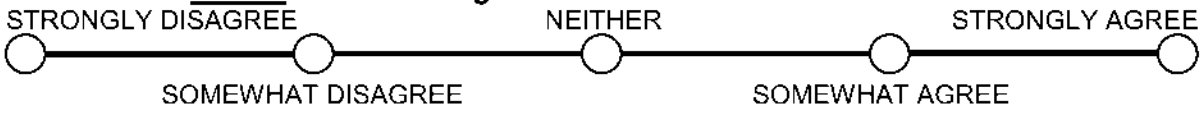
- ○ ONCE A DAY OR MORE
- ○ ONCE A WEEK OR MORE
- ○ ONCE A MONTH OR MORE
- ○ ONCE A YEAR OR MORE
- ○ LESS THAN ONCE A YEAR

Q57. Have you ever been in an area where <u>camel calves (babies and young camels)</u> are raised, kept, or present?

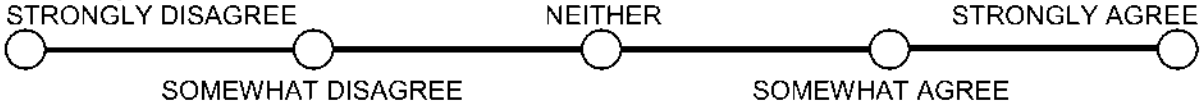
○ YES ○ NO

INTERVIEWER SCRIPT
Please listen to the following claims and state whether you agree, disagree, or neither.

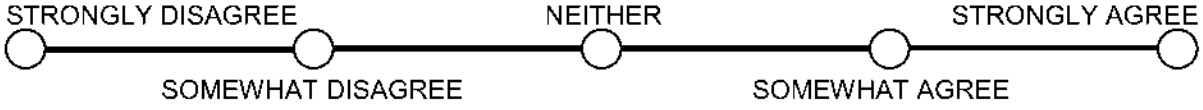
Q58. Camels <u>cannot</u> cause me to get sick.



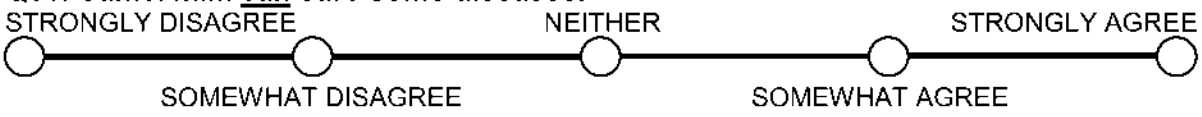
Q59. After touching a camel, wiping my hands with a towel or cloth is enough to fully clean my hands.



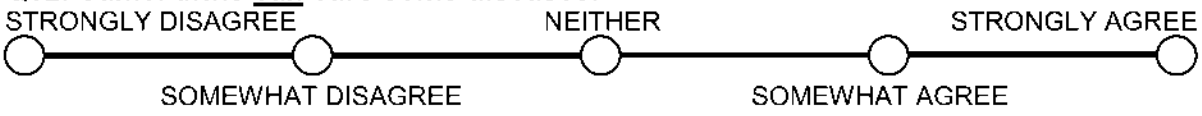
Q60. After touching a camel, it is important to me to wash my hands with soap and water before coming home to my family.



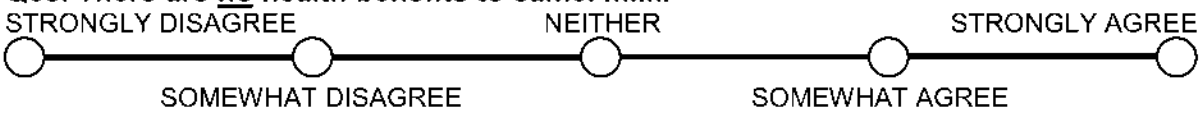
Q61. Camel milk <u>can</u> cure some diseases.



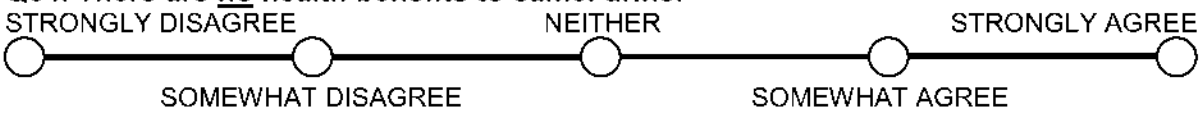
Q62. Camel urine <u>can</u> cure some diseases.



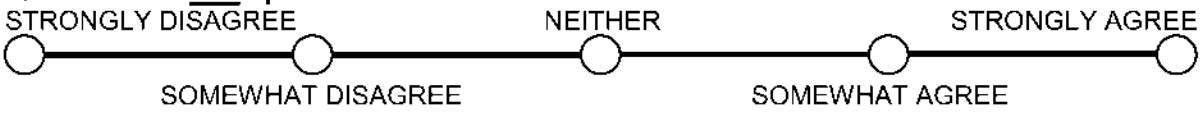
Q63. There are <u>no</u> health benefits to camel milk.



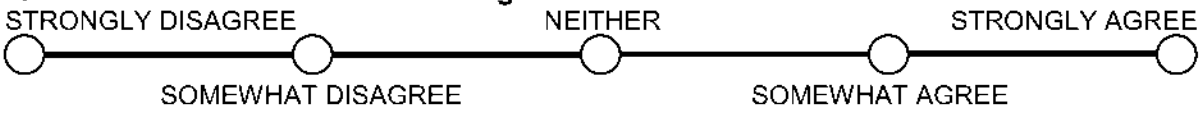
Q64. There are <u>no</u> health benefits to camel urine.



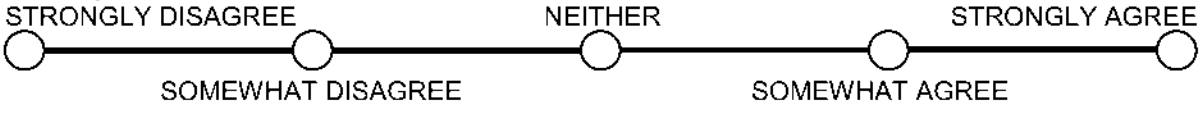
Q65. Camels <u>can</u> spread diseases to humans.



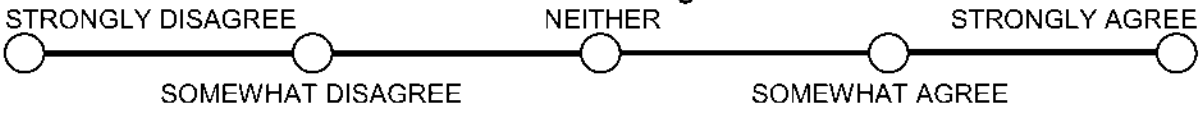
Q66. I believe someone I know has gotten sick from a camel.



Q67. I prefer the taste of raw/non-boiled camel milk over boiled camel milk.



Q68. Camel milk should be boiled before drinking it.



Q69. I believe someone I know has gotten sick from drinking raw/non-boiled camel milk, and would not have if it had been boiled first.

Q70. I believe someone I know has gotten sick from eating raw/uncooked camel meat, and would not have if it had been cooked.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

Q71. If I am cooking camel meat, there is <u>no</u> need to clean any surfaces that have come in contact with raw/uncooked camel meat.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

Q72. If a camel spits or sneezes on me, I am <u>not</u> worried about becoming sick.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

Q73. If a camel spits or sneezes on my face, I should wash my face with soap and water.

STRONGLY DISAGREE — SOMEWHAT DISAGREE — NEITHER — SOMEWHAT AGREE — STRONGLY AGREE

Q74. Do any of your jobs or livelihoods involve the ownership, buying, selling, trading, farming, management, care, or production of camels, camel meat, camel milk, camel urine, camel hair, or any other camel product?

○ YES ○ NO

⇨ IF Q74 = "YES" COMPLETE THE CAMEL WORK MODULE.

X

For animal subjects research, our protocols will align with PREDICT protocols, with which our in-country teams have been complying for three years. These protocols are listed below and, as they are very extensive, a link to access them is provided. They will be modified to reference the specifics of this project's IACUC (as opposed to PREDICT's IACUC):

- 5.2.11 Livestock Sampling Methods (see next page)

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "Field Sampling Guides."

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Section 5.2.11 Livestock Sampling Methods: Cattle, Sheep, Goats, Camels, and Swine

Prepared by
Marcela Uhart, University of California, Davis
Christopher Kilonzo, University of California, Davis
Kali Holder, Smithsonian
Jonathan Epstein, EcoHealth Alliance
and the PREDICT One Health Consortium

Objectives: To safely collect biological samples from livestock.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

The authors assert that animal capture and sampling should always occur in compliance with all applicable laws and regulations and should only be undertaken after securing all necessary permits and approvals, including ethical approvals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Livestock Sampling Methods.

Table of Contents: Livestock Sampling Methods: Cattle, Sheep, Goats, Camels, and Swine

Section 5.2.11.a. Brief Overview of PPE

Minimum PPE Required for Livestock Sampling

The minimum PPE for livestock (including camels, cattle, sheep, goats, and swine) sampling includes:

1. Dedicated clothing
2. Nitrile (recommended) exam gloves
3. Safety glasses or other eye protection

(See the PREDICT ***Biosafety and PPE Guide (Section 4.1)*** for detailed instructions regarding PPE Use)

Standard disinfection procedures for equipment and clothing should be followed when moving between animal enclosures or properties.

Section 5.2.11.b. Livestock Handling and Welfare

Performance standards during handling include careful, considerate, respectful, calm, human interactions with animals in as positive a manner as is possible. Animals handled in a respectful manner will be calmer and easier to handle than animals handled in a rough or disrespectful manner. PREDICT field staff should be familiar with the correct techniques and the anatomy of each livestock species before attempting sampling procedures. At all times, observe animals for signs of excessive distress. If animals are unwell, stop all procedures, provide adequate support care, and release upon recovery.

While most veterinarians are familiar with handling livestock, we recommend that PREDICT staff visit the following guidelines as a refresher.
http://www.dardni.gov.uk/safe_cattle_handling_guidance.pdf

For more information on Animal Handling and Transport, see:
http://www.fass.org/docs/agguide3rd/Chapter05.pdf

For more information on welfare considerations for cattle handling, see:
http://www.animalwelfarestandards.net.au/files/2011/02/Cattle-Standards-and-Guidelines-for-Endorsement-May-0807141.pdf (Section 5, pages 13-16) and
Beef cows: **http://www.fass.org/docs/agguide3rd/Chapter06.pdf**
Dairy cows: **http://www.fass.org/docs/agguide3rd/Chapter07.pdf**

For more information on welfare considerations for sheep handling, see:
http://www.animalwelfarestandards.net.au/files/2011/02/Sheep-Standards-and-Guidelines-for-Endorsement-May-2014-080714.pdf (Section 5, pages 14 and 15) and
http://www.fass.org/docs/agguide3rd/Chapter10.pdf

For more information on welfare considerations for blood collection from cattle, see:
http://www.dpi.nsw.gov.au/agriculture/livestock/animal-welfare/general/livestock/sop/cattle/blood-collection

For more information on welfare considerations for swine handling, see:
http://www.fass.org/docs/agguide3rd/Chapter11.pdf

For more information on welfare considerations for camels handling, see:
http://www.publish.csiro.au/Books/download.cfm?ID=5204

Section 5.2.11.c. Sample Data Collection

Introductions and informed consent
Upon arriving to a household or farm, introduce yourselves (team members, purpose of the visit) to the acting head of household responsible for the livestock. Explain the purpose of the study, allow time for questions, and clarify any issues that may arise. If local regulations require it, obtain informed consent per project guidelines and protocols.

Animal Handling and Sampling Procedures
Note: For all food animals, manual restraint will be used. If drugs are used for sedation in a food animal, that animal will not be allowed to return the human food chain unless it is specifically labeled for use in that species and withdrawal periods are observed

The following basic set of samples should be collected from each animal where possible (If only one sample can be collected, then place into VTM):

1. **Two nasal swabs** - one in 500 µL VTM and one in 500 µL Trizol
2. **Two fecal samples** - one with max of 500 µL/0.5cc feces in 500 µL VTM and one with max of 500 µL/0.5cc feces in 1 mL Trizol
   Or
   Two rectal swabs - one in 500 µL VTM and one in 500 µL Trizol
3. **Two whole blood samples** - one with max of 500 µL of whole blood in 500 µL VTM and one with max of 500 µL of whole blood in 500 µL Trizol
4. **Two serum samples** - 2 x 1.0 ml aliquots frozen without media
5. **Two urogenital swabs or urine samples** - one with max of 500 µL of urine in 500 µL VTM and one with max of 500 µL of urine in 500 µL Trizol

Freeze all samples (except tissue in formalin) in liquid nitrogen immediately in the field and transfer to -80°C freezer once back in the lab.

If there is no **short-term** access (i.e. within 24 hours) to cold chain such as in an emergency situation, then samples can be collected in 500 µL of RNAlater instead of Trizol and VTM. Storage times and temperatures for samples in RNAlater are as follows:

- 1 day at 37 °C (i.e. ambient temp)
- 1 week in the refrigerator
- Within one week freeze at -80 °C for storage until analysis

Collecting Nasal Swabs

Using sterile, polyester-tipped swabs with a plastic shaft, rub the swab tip gently but thoroughly against the walls of the animal's nares, about 1-2" from the opening, saturating the swab with mucus. **Place 1 swab in a cryovial filled with 500 µl of VTM and the other swab into 500 µL of Trizol in another cryovial**. Mix each tube well. Store both cryovials in a liquid nitrogen dry shipper or dewar & transfer to -80˚C freezer when possible.

Bleeding Collection Techniques

1. Cattle

Blood can be collected from the jugular vein in cattle of all ages or from the tail (coccygeal) vein of older cattle.

A variety of collection devices may be used - vacutainers, bleeding tubes, syringe and needle. Restraint should ensure quick, easy and safe collection of the sample causing minimal distress. This may involve use of a bail, race, or crush for tail bleeding. For jugular bleeding the animal may require minimal restraint (e.g. halter) or may need to be restrained in a crush with head bail and the employment of a halter or nose grips. Use of nose grips should be avoided wherever possible.

Operators should use gloves and disinfect or replace them between animals to prevent the transmission of blood-borne diseases. Equipment such as vacutainer holders should also be cleaned between animals. An antiseptic must be applied to clean skin surface prior to venipuncture.

For a visual guide see the following online tutorials:

Cattle
https://www.youtube.com/watch?v=IuNbsTMrIuI (tail and jugular)
https://www.youtube.com/watch?v=ZEsHMwKFbKg (tail)
https://www.youtube.com/watch?v=812CskWCqGQ (jugular)

Procedure for Jugular Venipuncture Using Vacutainer Needle and Tubes:

1. Identify and georeference the study site and document the signalment of the animal on the data collection sheet.
2. Before sample collection, ensure that the animal is effectively and humanely restrained to avoid injury to the animal and/or study personnel.

3. Using the halter, position the animal's head so that it is slightly elevated and drawn to the side opposite the jugular vein to be sampled.
4. Disinfect venipuncture area with alcohol
5. Occlude the vein by applying digital pressure in the jugular groove located in the lower neck.
6. Place a vacutainer needle attached to a vacutainer holder into the distended jugular vein at a 45° angle cranial to the jugular groove.
7. Once needle is positioned in the vein, insert a vacutainer into the needle to collect the blood.
8. When the desired volume has been collected (5 ml minimum suggested) remove the occluding pressure from the vein.
9. Detach the tube from the needle and withdraw the needle from the jugular vein.
10. You can collect more than 1 tube by repeating steps 7 and 8.
11. Label the vacutainer tubes with the sample ID.

Procedure for Jugular and Coccygeal Venipuncture Using Syringe and Needle

Jugular bleeding

1. Restrain cow with the head elevated and the jugular groove exposed.
2. Raise the jugular vein by placing pressure at the base of the jugular groove.
3. Pass the needle through the skin and into the vein by a firm thrust directed at an angle of 20° to the skin surface.
4. Withdraw the blood sample.

Tail Bleeding

1. Restraint should prevent the cow from moving away during the procedure.
2. Raise the tail vertically with one hand until it is horizontal with the ground.
3. Approximately 150 mm from the base of the tail, locate the groove lying in the ventral midline of the tail.
4. Midway along the body of a coccygeal vertebra, insert the needle perpendicularly to the surface of the skin to a depth of a few millimeters.
5. Withdraw blood sample.
6. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

Once blood is collected, place the needle into a sharps container. Open red-top and purple top vacutainer tubes. Place approximately 2.5cc in each tube, then discard the syringe into a biohazard container. Invert each tube several times to mix.

2. Sheep/Goats

Blood should be collected from the jugular vein. The procedures for blood collection are identical to those described for cattle, with the exception of the amount of restraint needed and the possibility of shearing the bleeding area on the neck for easier viewing of the vein and minimizing the chance of introducing dirt or bacteria into the vein with the needle.

In sheep and goats, blood sampling can be done with assistance or alone. If you are not proficient at drawing blood alone, work with an assistant. The assistant should restrain the sheep/goat's body and turn the head to the side, at a 30-degree angle, by holding the animal under its jaw to allow for easy access to the jugular vein.

Restraining a sheep or goat without assistance is better for those who have become proficient at drawing blood. The handler should straddle the sheep/goat, place his or her knees behind the animal's shoulders, and back the sheep/goat into a corner or against a wall to help control their hindquarters. The sheep/goat's head should be turned opposite to the side of collection, once again at a 30-degree angle. Restraint of the head is accomplished by using the elbow and the upper arm to keep it held off to the side. This leaves both hands available for the blood collection.

The easiest way to locate the vein is to draw an imaginary line from the middle of the sheep/goat's eye down the side of the neck. The vein can be located by applying pressure with the thumb or fingers in the groove on either side of the trachea. The pressure will cause the vein to pop up and be easy to feel or see if the area has been shaved. Proceed as with cattle, using a vacutainer collection system or syringe and needle.

For a visual guide see the following online tutorials:

Sheep/goats (small ruminants) **https://www.youtube.com/watch?v=47tlmqXX3eE**

Blood sample processing and storage:

Whole Blood

- Collect whole blood into 1 lavender top tube containing EDTA, and allow another tube to clot for collection of serum.
- Add up to 500 µL of whole blood (from EDTA tube) directly into 2 vials, one containing 500 µL Trizol and one containing 500 µL VTM (= maximum final ratio of 1:1) and mix each vial well.

Serum

- After clotting is complete, use a plastic pipette to take 1 ml of serum and transfer into 2 cryovial tubes, 0.5 ml each.
- If a centrifuge is available, centrifuge samples for 15 minutes and then collect 1 ml serum and transfer into 2 cryovial tubes, 0.5 ml each.
- Label the cryovial tubes with the same label information used on vacutainer tube.
- You can harvest additional serum for serum bank as appropriate.
- Freeze all samples in liquid nitrogen immediately in the field and transfer to -80°C freezer once back in the lab.

3. Camels

Because of the risk of MERS CoV exposure, sample collectors should wear gloves, a respirator, and eye protection when handling camels.

Blood can be collected from the jugular vein in camels of all ages, though it is recommended that this be undertaken on animals while they are in sternal recumbency (kush position), well-restrained, or sedated. The lateral thoracic vein or caudal epigastric ("milk") vein may be used but should only be targeted in animals where physical or chemical restraint prevents kicking.

A vacutainer needle (18G or 19G) with purple top (EDTA) tubes and red-top (with serum clot activator) tubes may be used, or a 5cc syringe and 18G or 19G needle. Restraint should ensure quick, easy and safe collection of the sample causing minimal distress.

Equipment such as vacutainer holders should be cleaned between animals.

Procedure for Jugular Venipuncture Using Vacutainer Needle and Tubes

1. Identify and georeference the study site and document the signalment of the animal on the data collection sheet.
2. Before sample collection, ensure that the animal is effectively and humanely restrained to avoid injury to the animal and/or study personnel.
3. Using the halter, elevate the animal's head and draw it to the side opposite the jugular vein to be sampled.
4. Disinfect venipuncture area with alcohol
5. Occlude the vein by applying digital pressure in the jugular groove located in the lower neck. Alternatively, a rolled towel affixed with a rope over the withers can be applied at the same level to act as a temporary incomplete tourniquet.
6. Place a vacutainer needle, attached to a vacutainer holder, into the distended jugular vein at a 45° angle cranial to the jugular groove.
7. Once the needle is positioned in the vein, insert a vacutainer into the needle and collect the blood.
8. When the desired volume has been collected (5 ml minimum suggested), remove the occluding pressure.
9. Detach the tube from the needle.
10. Detach the needle from the jugular vein and apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.
11. If more than one tube of blood is required, repeat steps 7 through 9 with occluding pressure.
12. Label the vacutainer tubes with sample ID.

Note: If vacutainer needles are unavailable, a 5cc syringe and 18G or 19G needle can be used. Once blood is collected, place the needle into a sharps container. Open red-top and purple top vacutainer tubes. Place approximately 2.5cc in each tube, then discard the syringe into a biohazard container. Invert each tube several times to mix.

Whole blood can be aliquoted into cryotubes with VTM and Trizol using a pipette gun. Serum tubes can either be centrifuged (if available) or placed vertically in a cooler with ice bricks and allowed to stand undisturbed overnight (~12 hours) for clean serum separation. Serum can then be aliquoted into cryotubes.

Procedure for Jugular Venipuncture Using Syringe and Needle

Jugular bleeding

1. Restrain camel with the head elevated and the jugular groove exposed.
2. Disinfect venipuncture area with alcohol
3. Raise the jugular vein by pressure at the base of the jugular groove.
4. Pass the needle through the skin and into the vein by a firm thrust directed an angle of 20° to the skin surface.
5. Withdraw blood sample.
6. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

Lateral Thoracic/Caudal Epigastric Vein Bleeding

1. Restraint should prevent the camel from moving away or kicking during the procedure.
2. Identify the lateral thoracic vein, caudal to the point of the elbow's olecranon process.
3. Pass the needle through the skin and into the vein by a firm thrust directed an angle of 20° to the skin surface.
4. Withdraw blood sample.
5. Apply pressure to the venipuncture site after withdrawal of the needle until the bleeding stops.

4. Swine

All personnel handling or sampling pigs should wear appropriate PPE and practice appropriate biosafety practices to avoid spreading infection from one animal to another and from one herd, farm or property to another. This includes wearing dedicated clothing (e.g. coveralls and rubber boots) that can be removed and disinfected once work at a site has been completed. Recommended PPE includes nitrile gloves, a respirator and safety glasses.

Restraint: Manual restraint is recommended, without the use of anesthesia. Pigs to be sampled should be constrained to a separate pen, if possible. The use of a snout snare (see appendix) by the animal restrainer is recommended for pigs over 20 kg, but should only be used by experienced personnel and for short term restraint to avoid injury to the pig's snout. Pigs will be restrained for a maximum of three minutes and then released. If blood collection is unsuccessful, then the pig will be allowed to calm down for five minutes before a second attempt is made.

Blood can be collected from the external jugular vein, or the cranial vena cava, using a 1", 20G needle and a 5cc syringe. This technique requires the head to be restrained and elevated parallel to the ground, typically using a snout snare. In pigs weighing less than ~50 kg, blood can be collected further caudally (and more medially) in the jugular groove, nearer the manubrium from anastomose of internal and external jugular vein. For pigs weighing less than ~20 kg, a technician will manually restrain the pig on his lap, holding the forelegs in one hand, and the animal's head in the other. Then a max of 5.0 to 10 ml may be collected from the jugular vein. Venipuncture should only be performed by experienced personnel.

The marginal ear veins are the only veins that are easily visible on pigs of any size. Usually there are three prominent veins. The lateral or central vein is usually the largest of these. These veins may also be punctured for blood collection. An alternative venipuncture site is the caudal auricular ("marginal ear") vein, though this typically yields low (<1 mL) blood volumes. A smaller, 22G or 23G needle should be used for this vein.

See also http://oslovet.norecopa.no/teaching/pig/pigbleed/ for more details on blood collection from pigs.

Collecting Fecal Samples

Ensure the animal is properly restrained prior to sampling. Fresh fecal samples should be collected, preferably from the rectum. If freshly passed, feces can be collected off the ground. Only the top part of a freshly passed fecal pat should be collected using a disposable spoon or scooped up in a gloved hand, plastic bag or plastic vial.

For Collection from the Rectum in Cattle and Camels

- The operator places an obstetrical sleeve on one arm
- The arm is formed into a cone and the animal's tail held to one side with the opposite gloved hand.
- Gentle pressure is applied to the anal sphincter until penetration into the rectum is obtained.
- A fecal aliquot of sufficient size for the intended laboratory procedure is scooped with the sleeved hand and removed from the animal.
- The fecal sample is placed in a separate container or the obstetrical sleeve is inverted off the arm such that the fecal sample is trapped inside.

Small calves, sheep, goats, and swine: restrain manually. Gently pass a gloved, lubricated finger through the anus and massage the rectal wall to stimulate rectal evacuation. If feces are not produced, collect feces with finger.

Place two ~200 mg (pea size) samples of fresh feces into 2 vials, one containing 500 µL VTM (= maximum final ratio of 1:1) and one containing 1 mL Trizol (= maximum final ratio of 1:2). Homogenize by shaking. Freeze in dry shipper or dewar with liquid nitrogen and transfer to -80˚C freezer when possible.

If feces are not available, collect 2 rectal swabs- 1 in VTM and 1 in Trizol: Gently insert one sterile swab tip at a time into the animal's rectum. [Note: DO NOT USE TRIZOL AS A LUBRICANT – IT IS HIGHLY IRRITATING TO TISSUE.] Place 1 swab in a cryovial filled with 500 µL of VTM. Place the other swab into a tube with 500 µL of Trizol. Store in a dewar or dry shipper with liquid nitrogen dry shipper and transfer to -80˚C freezer when possible.

Collecting Urine/Urogenital Swabs

Many animals will urinate as a fear reaction while they are handled. Urine can be collected free catch in plastic vials. Add up to 500 µL of urine directly into 2 vials, one containing 500 µL VTM and one containing 500 µL Trizol (= maximum final ratio of 1:1) and mix each tube well. Store in dry shipper or dewar with liquid nitrogen and transfer to -80˚C freezer when possible.

If urine is not available, collect 2 urogenital swabs: 1 in VTM and 1 in Trizol. Place 1 swab in a cryovial filled with 500 µL of VTM. Place the other swab into a tube with 500 µL of Trizol. Store in a dewar or dry shipper with liquid nitrogen dry shipper and transfer to -80˚C freezer when possible.

Section 5.2.11.d. Sample Collection from Dead or Euthanized Livestock

PREDICT's primary approach to sample collection in livestock is to collect specimens from living animals. In the event that an animal has died of natural causes or been euthanized due to humane or veterinary care reasons, the guidelines below for necropsy sampling may be followed. If bodies are relatively whole and fairly fresh, then sample as described above. The *American Veterinary Medical Association guidelines (Section 8.5.2.)* in the PREDICT Operating Procedures ebook provides information on animal euthanasia that may be useful to PREDICT veterinarians called upon to euthanize an animal.

As discussed throughout this protocol, all animals should be considered potentially infectious for a wide variety of dangerous pathogens, and dead animals in particular should be sampled only following all safety measures, including proper PPE use, proper work station decontamination, and proper carcass disposal, as outlined here and in other PREDICT documents.

Though not required for PREDICT sampling, thorough necropsy procedures can be very beneficial and relevant for some animals (e.g., suspicious deaths). Time and skill permitting, when full necropsies are performed, following any Association of Zoos and Aquariums/AZA (or similar) necropsy protocol is recommended and most can be adjusted for application to livestock species. Necropsy protocols are also addressed in the Non-Human Primate Sampling protocol, Appendix V.: AAZV's Occupational Primate Disease Safety Guidelines for Zoological Institutions: Standardized Necropsy Report for Non-Human Primates Work Sheet (ebook Section 5.2.6j.); most of the information and worksheets in this document can be utilized for sampling of

livestock. (*Note that properly following extensive necropsy procedures and collecting and measuring all samples can require 4-6 hours for a single animal.*)

Duplicate blood samples are to be collected from each animal; one sample must be collected into Trizol and one into viral transport media (VTM). If only one sample can be collected, then place the sample into VTM.

Tissue specimens should be collected in triplicate. One specimen should be frozen in 500 µL VTM in a cryovial, one should be frozen in 1 mL Trizol in a cryovial, and one should be stored at room temperature in a small vial or jar in 10% buffered formalin at a volume of fixative 10 times the volume of the tissue (once fixed, the tissue may be transferred to a smaller volume for shipment).

Post-Mortem Blood Collection

From recently dead animals, it may be possible to collect whole blood (often clotted) from the right side of the heart where the largest volume of blood is available. Collect all available blood into an appropriate size container (typically one or more blood tubes). Allow the tubes to sit undisturbed for at least 30 minutes, and then centrifuge at high speed (2000 x G for 20 minutes). Transfer the serum (clear, yellow or red-tinged fluid at the top), preferably via pipetting, to appropriately labeled cryovials. Transfer the remaining blood clots to separate cryovials. Refrigerate or freeze both the serum and blood clots.

If a centrifuge is not available, allow the clots and cells to settle as much as possible, and then collect the serum and clots as described above. If the animal's death is recent enough that the blood has not yet clotted and a centrifuge is not available, invert the blood tubes after the blood has been collected to allow the clot to form on the rubber stopper. After the blood has clotted, turn the tube right side up and carefully remove the stopper with the adhered clot, thereby leaving a clean serum sample in the tube.

At a minimum, as many of the following blood samples as possible should be collected:

- 2 samples of 500 µL (**whole blood**) placed in 2 vials, one containing 500 µL **Trizol** and one containing 500 µL **VTM** (= maximum final ratio of 1:1). Mix each vial well.
- 2 or more aliquots (0.5 ml) of **separated serum**, frozen

Tissue Collection

Collect three, adjacent, approximately 200mg (pea-sized) samples of the following tissues:

- Adrenal
- Colon
- Heart
- Liver
- Lymph node
- Ovary
- Testes
- Cecum
- Duodenum
- Kidney
- Lung
- Spleen
- Pancreas
- Other, if required*

*It will usually require experience to identify abnormal tissues, but potentially recognizable gross lesions include masses, discolored areas, ulcerations, etc. Samples for histopathology (i.e., in formalin) should be collected at the abnormal margins to include both normal and abnormal sections in the same piece of tissue. Collection of any obvious internal parasites in ethanol is also recommended.

Section 5.2.11.e. References

Higgins, A. J., & Kock, R. A. (1984). A guide to the clinical examination, chemical restraint and medication of the camel. *The British Veterinary Journal*, *140*(5), 485–504.

Fowler, M. E. (2010). Chapter 4 Clinical Diagnosis: Examination and Procedures in *Medicine and Surgery of Camelids*. (3 edition). Ames, Iowa: Wiley-Blackwell.

http://www.dardni.gov.uk/safe_cattle_handling_guidance.pdf

http://www.fass.org/docs/agguide3rd/chapter05.pdf =

http://www.dpi.nsw.gov.au/agriculture/livestock/animal-welfare/general/livestock/sop/cattle/blood-collection

http://www.biotracking.com/goats/biopryn/use

Section 5.2.11.f. Appendix I. Dentition Age Determination for Cattle, Sheep, and Goats

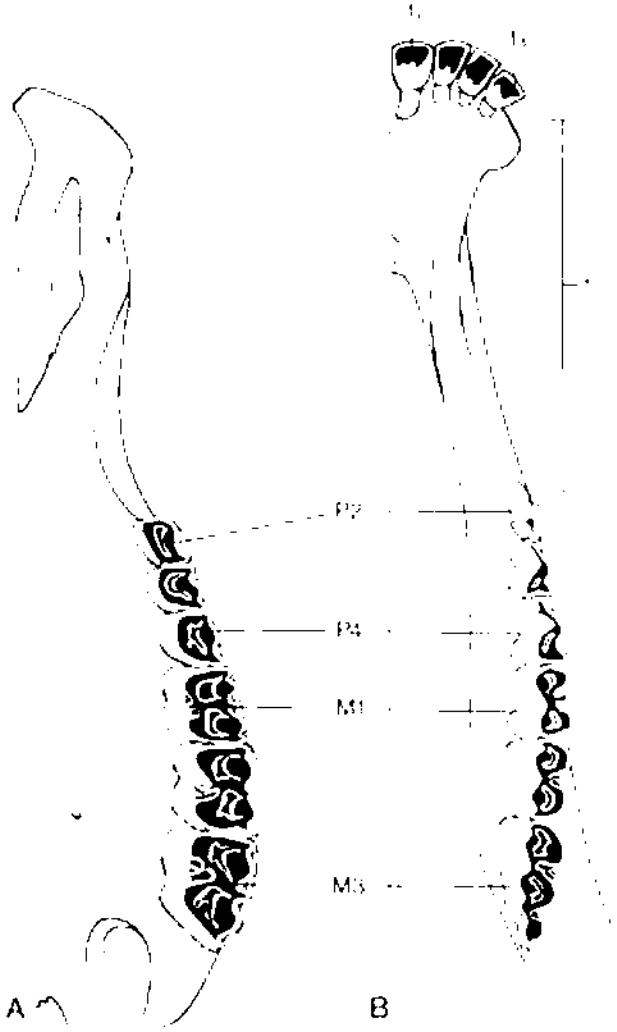

FIGURE 25–20. Left half of upper and right half of lower jaw of cattle. Notice the different shapes of the upper and lower cheek teeth and the large diastema (D).

Figure 1: From Dyce, Keith M., Wolfgang O. Sack, and Cornelis Johannes Gerardus Wensing. Textbook of Veterinary Anatomy. Elsevier Health Sciences, 2009.

Table 1: Eruption dates of the teeth of cattle

Teeth	Deciduous Teeth	Permanent Teeth
Incisor 1	Birth to 2 weeks of age	18 – 24 months
Incisor 2	Birth to 2 weeks of age	24 – 30 months
Incisor 3	Birth to 2 weeks of age	36 months
Incisor 4	Birth to 2 weeks of age	42 – 48 months
Premolar 2	Birth to 1 week	24 – 30 months
Premolar 3	Birth to 1 week	18 – 30 months
Premolar 4	Birth to 1 week	30 – 36 months
Molar 1		12 – 18 months
Molar 2		24 – 30 months
Molar 3		18 – 24 months

Table 2: Eruption dates of the teeth of sheep and goats.

Teeth	Deciduous Teeth	Permanent Teeth
Incisor 1	Birth to 1 weeks of age (at birth)	12 – 18 months
Incisor 2	Birth to 1 weeks of age (at birth)	18 – 24 months
Incisor 3	Birth to 1 weeks of age (at birth)	30 – 36 months
Incisor 4	1 to 3 weeks	36 – 48 months
Premolar 2	3 weeks	18 – 24 months
Premolar 3	3 weeks	18 – 24 months
Premolar 4	3 weeks	18 – 24 months
Molar 1	3 – 4 months	
Molar 2	8 – 10 months	
Molar 3	18 – 24 months	

Section 5.2.11.g. Appendix II. Snares

Figure 1: A commercial snout snare (left) and use of a modified snout snare, made from local materials, to restrain a pig during sampling in Bangladesh (right).

Section 5.2.11.h. Appendix III. Checklist for Supplies

General equipment and supplies

- ☐ Animal handling equipment – Halters and animal restraining ropes
- ☐ Data Collection forms
- ☐ Rubber stamp ink and pad
- ☐ GPS
- ☐ Camera
- ☐ Field Notebook
- ☐ Pen/Pencil
- ☐ Permanent markers
- ☐ Cryomarkers
- ☐ Protective clothing – Waterproof rubber boots, overalls, facemask, and nitrile gloves
- ☐ First aid kit
- ☐ Ice box containing ice packs (for short term storage and transport)
- ☐ Sharps bin
- ☐ Sturdy garbage bags
- ☐ Field centrifuge (portable 12vt)
- ☐ Liquid nitrogen dewar

Blood sample collection equipment and supplies

- ☐ EDTA vacutainer tubes – 9ml (lavender top)
- ☐ Serum separator vacutainer tubes – 9ml (red/gray top)
- ☐ Vacutainer needle holders
- ☐ Vacutainer needle: Cattle and Camels, 1½" 18 or 19 gauge; Sheep, Goats, and Swine, 1" 20G
- ☐ Syringes: 20, 10 and 5 ml
- ☐ Needles: Cattle and Camels, 1½" 18 or 19 gauge; Sheep, Goats, and Swine, 1" 20 guage for jugular or 22 or 23 gauge for auricular vein
- ☐ Alcohol (squirt bottle or vaporizer)
- ☐ Gauze
- ☐ Vacutainer tube rack
- ☐ Cryovial tubes
- ☐ Cryovial rack
- ☐ Centrifuge
- ☐ VTM
- ☐ Trizol

Fecal Sample Collection Equipment and Supplies

- ☐ Obstetrical Sleeve
- ☐ Disposable Spoons
- ☐ Plastic bags or vials
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Urine Sample Collection Equipment and Supplies

- ☐ Plastic vials
- ☐ Plastic pipettes
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Swab Collection Equipment and Supplies

- ☐ Plastic handle, polyester tip swabs
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol

Tissue Collection Equipment and Supplies (in case of animal necropsy)

- ☐ 21 Gauge needles for cardiocentesis
- ☐ 1 mL Syringe for cardiocentesis
- ☐ Scalpel and surgical blades
- ☐ Forceps
- ☐ Sharp and blunt tip scissors
- ☐ Cryovial Rack
- ☐ Cryovials with VTM and Trizol
- ☐ Small Vials or Jars
- ☐ 10% Buffered Formalin

Section 5.2.11.i. Appendix IV. Additional Permit Requirements for Livestock Samples Imported into the United States

In addition to all other permits, livestock samples require special import permits from the USDA.

http://www.aphis.usda.gov/publications/plant_health/2012/fs_imp_food_ppq.pdf

http://www.aphis.usda.gov/wps/portal/aphis/resources/permits/!ut/p/a1/jZDLDoIwFES_hi0dKmJ1VyVCfUVjjNiNQYOVBKgpKL8vGjfG5-zuzTnJZlgkEZFFfElVXKW6iLPbLb2tKxilLVDBlgsPYjiftQeUOgi8Btg0wCDgoduZAHAZhfD7od_pTgHh_efjQzh--Wsin5HA4X7jLSezRTgExs4D-FbxDnzpMCJSZXp332PDi12LKSJNckhMYuyzad7HqjqVPQsW6rq2ldYqS-y9zu3YWHhnHXVZkegFJqd8FSGd52tW8ivrt9DV/?1dmy&urile=wcm%3apath%3a%2Faphis_content_library%2Fsa_our_focus%2Fsa_animal_health%2Fsa_import_into_us%2Fct_animal_imports_home

7. GUIDELINES FOR SAMPLE TRANSPORT

Sample transport from the human and animal field sites will follow established protocols from the PREDICT project, which JUST has been implementing for three years. We will adhere to these cold chain protocols except where necessary to modify to meet the project's specific requirements:

- 6.1 Implementing Cold Chain for Safe Sample Transport and Storage (see next page)

Available at: https://ohi.vetmed.ucdavis.edu/programs-projects/predict-project/publications under "General Information."

Section 6.1. Implementing Cold Chain for Safe Sample Transport and Storage

Prepared by
David Wolking, University of California, Davis,
and the PREDICT One Health Consortium

Objective: To provide principles and general considerations for cold chain maintenance, the safe transport and storage of samples collected during PREDICT surveillance activities, and the safety of personnel.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Implementing Cold Chain for Safe Sample Transport and Storage.

Table of Contents: Implementing Cold Chain for Safe Sample Transport and Storage

Section 6.1.1. Introduction to Cold Chain

This guide focuses on implementing an efficient cold chain and sample transport/storage plan appropriate for PREDICT disease surveillance activities. The guidance provided is to ensure that all PREDICT materials arrive at their end laboratories in suitable condition for PREDICT diagnostics and pathogen testing. When you are familiar with the information in this Guide, take the PREDICT quiz on ***Implementing a Cold Chain for Safe Sample Transport (Section 8.4.14.)***.

A cold chain is a monitored temperature-controlled supply chain. The goal of the cold chain is to keep a sample or material within a certain temperature range during all stages of delivery, processing and storage (Figure 1). Cold chains are widely used to ensure the viability of products in the pharmaceutical and agricultural sectors, and are critical components of vaccination programs and bio-medical surveillance activities.

Many biological samples deteriorate when exposed to heat, sunlight, or fluorescent light. When transporting and storing such biological substances, it is imperative that field and laboratory teams control environmental conditions, ensuring that exposure to potentially damaging environmental factors is minimized.

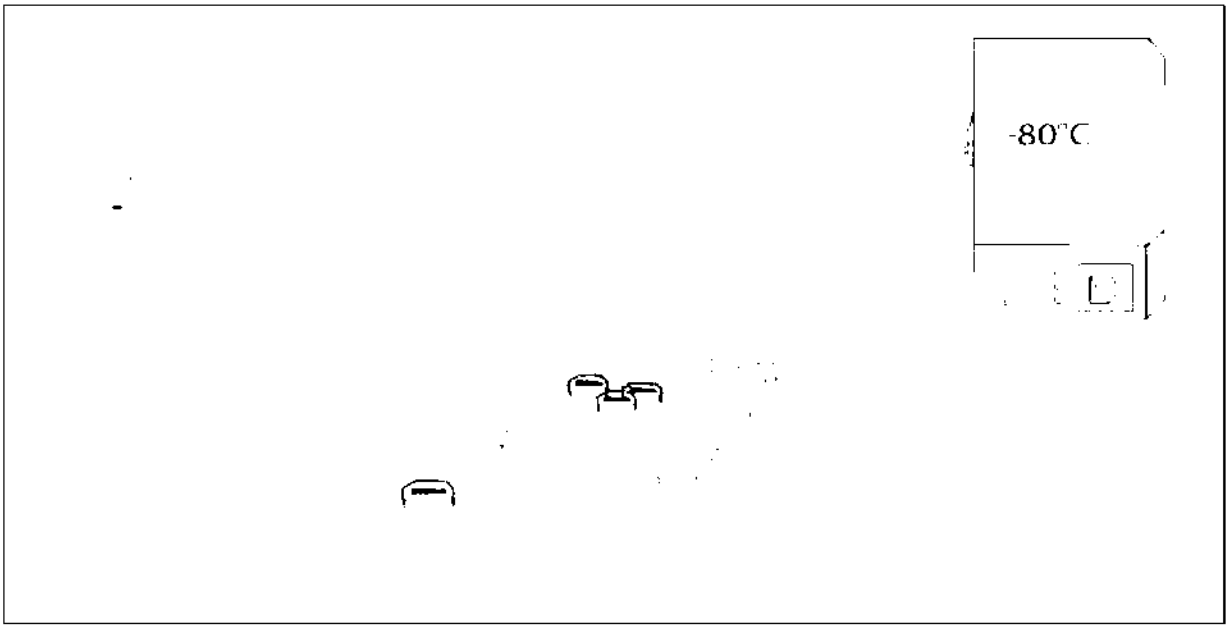

Figure 1: Illustration of a typical cold chain from field to lab storage for PREDICT biological samples. Field teams sample an animal and place specimens in liquid nitrogen dewar for storage. The dewar with specimens is transported in the back of a project vehicle to long-term storage at a PREDICT laboratory or field station, inventoried, and archived until testing in an ultra-low temperature freezer (<-80°C).

Freezing is the simplest way to ensure that the biological samples remain viable for laboratory analysis. The cold chain for PREDICT samples can be maintained through the use of ice packs, coolers and dry ice (for a very brief period immediately following collection), liquid nitrogen (LN2) containers and freezers, and the use of ultra-low temperature (-80°C and colder) freezers. It is recommended that PREDICT samples be placed in LN2 or ultra-low temperature freezers as soon as possible to optimize sample viability for diagnostics and pathogen testing.

Repeated exposure to heat leads to a cumulative and irreversible loss of sample viability and may render a sample useless for laboratory analysis.

PREDICT Sample Cold Chain Requirements: All biological samples from PREDICT surveillance activities should be stored and transported at temperatures colder than -80ºC suitable for the preservation of targeted PREDICT pathogens and viral detection.

Section 6.1.2. Implementing the Cold Chain

This section introduces recommended steps for cold chain planning and implementation.

Section 6.1.2a. Planning

The first step in implementing the cold chain is planning. Your team must identify the cold storage needs for your sampling activities, then identify and procure all necessary materials and resources. In addition, it is critical to train your team to understand the logistics of the cold chain, how to monitor cold chain temperature, and how to maintain system records.

Considerations for Cold Chain Planning:

1. What is your surveillance plan and what type of cold chain is appropriate for that plan? What types of samples are you collecting? What are the temperature requirements for safely storing these samples?
2. Assess local context and conditions. Do you have access to long-term sample storage facilities? Are your sampling activities located in remote rural locations several days or weeks from the project infrastructure or laboratory?
3. Determine where the cold chain ends. If your field team delivers samples to a laboratory with an ultra low temperature freezer, then initiating your cold chain may require simply extending it from laboratory to sampling site through the use of LN2 dry-shippers or dewars. If you are developing a cold chain without any pre-existing infrastructure, mapping out an appropriate cold chain from sample collection to endpoint is essential (Figure 2).
4. Determine the maximum amount of time samples will be located outside of long-term cold storage. If your field activities are 5 days away from long-term storage, then you will need a minimum of 5 days mobile cold storage in LN2. If you plan to export samples, how long will it take to ship from origin to destination?
5. Determine the minimum amount of time samples will stay in long-term storage. Planning for long-term storage requires assessing the space necessities of your cold chain. Are you

maintaining a sample bank or archive? If so, you will need to plan for sufficient storage space for the life of the project to preserve sample viability.

6. Establish procedures for monitoring the cold chain and tracking the samples moving through the cold chain. Confirm all team members have been trained in cold chain maintenance and record keeping. Prepare forms for data logging and recording. Prepare a schedule for re-filling LN2 containers and contingency plans for equipment failure.

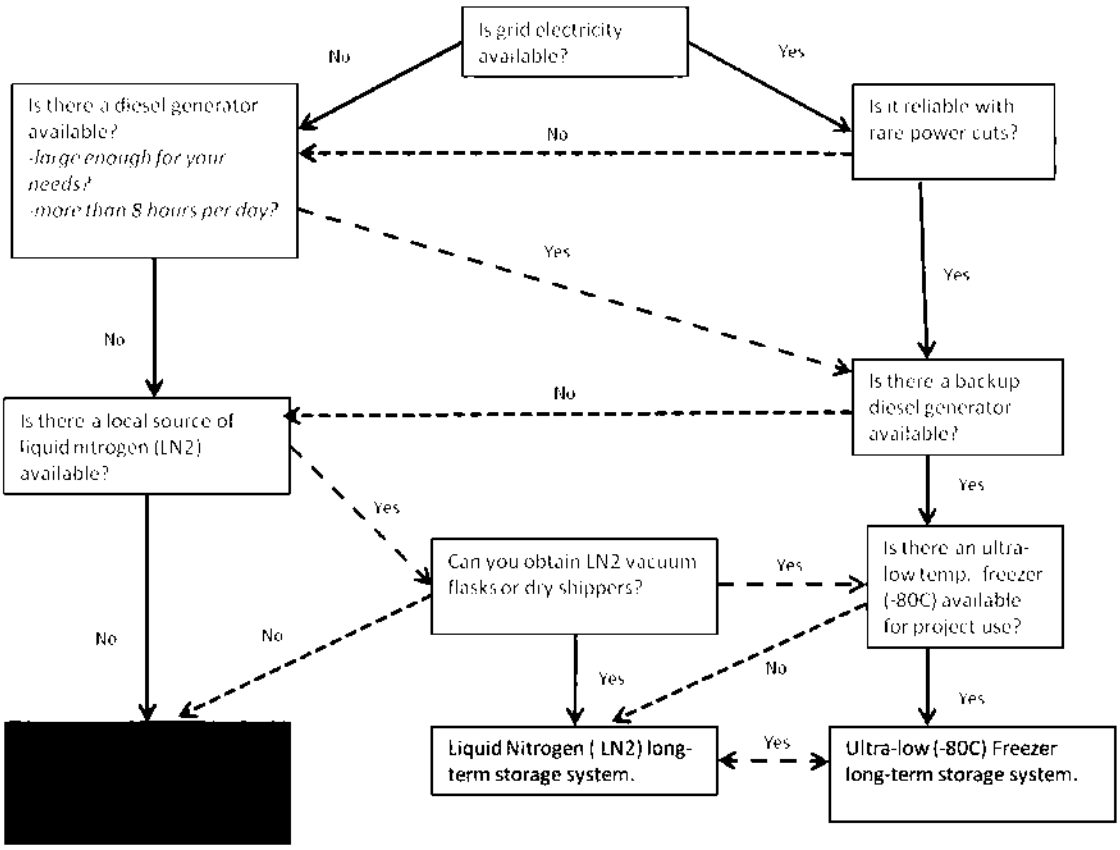

Figure 2: A decision tree for cold chain planning. Based on United Nations World Food Program Logistics Cluster "Logistics Operational Guide".

Developing a Cold Chain System

To develop and maintain a cold chain, a series of simple and routine processes must be established. These processes should be designed to function efficiently in each team's environmental and local conditions, and should be easy to maintain with available materials and resources.

1. Assess the opportunities and constraints to developing a cold chain in your area. These may include:
    a. Access to a pre-existing cold chain
    b. Access to LN2, and LN2 transport and storage supplies
    c. Access to an ultra-low temperature (sub -80°C) freezer available for use
        i. If freezer available, does it have a backup generator and alarm system?

2. Identify the appropriate materials and resources needed to implement and maintain the cold chain. Required materials and resources may include:
    a. Personal Protective Equipment (PPE) for working with LN2 and -80ºC freezers
    b. Coolers
    c. Ice/gel freezer packs
    d. Liquid Nitrogen (LN2) dewars and/or LN2 vapor-phase dry shippers (see distinctions below in Table 2)
    e. Source of LN2
    f. Large capacity LN2 storage dewars or ultra-low temperature (<-80°C) freezers for longer-term sample storage
    g. Temperature gauges, thermometers, data loggers (as needed), alarm systems, and an alert network for staff when facilities are unoccupied
    h. Appropriate sample storage containers and racks for sample organization
3. Identify local suppliers or other sources for procurement of materials and resources. (Note: Carefully assess the reliability/sustainability, and costs of any suppliers to assure procurement of reliable supplies and ability to service equipment.)
4. Establish a written protocol for monitoring the cold chain and stored samples. The protocol should cover:
    a. Temperature regulation and record
    b. Sample storage and tracking system
    c. Equipment maintenance schedules
    d. Response procedures in event of container/freezer failure or power outage
    e. Training programs to ensure continued and safe operation of cold chain system
    f. Annual review of cold chain operation and sample storage procedures

Cold Chain Materials and Resources

A cold chain can consist of any combination of materials and resources that serve to maintain samples at a desired temperature. **For all PREDICT samples, that temperature is -80°C or lower.** This temperature range requires the use of specialized cooling technologies and specially designed freezers. Gas-based coolants (LN2) do not require electricity, and can be deployed to remote and rural areas. In contrast, ultra low temperature (< -80°C) commercial freezers are dependent upon an electrical grid and emergency generators in the event of blackouts or grid failure.

Safety Considerations for Coolants

Working with cold chain coolants can be dangerous if appropriate precautions are not taken. The recommended PREDICT cold chain requires samples to be stored in temperatures well below freezing. Exposure to these temperatures can cause severe burns and damage to living tissue. There are three coolants commonly used in implementing a cold chain: 1) ice/gel packs, 2) dry ice, and 3) liquid nitrogen (LN2). Dry ice and LN2 give off gases that can cause asphyxiation and should only be handled by trained personnel in ventilated areas. In addition, dry ice and LN2 containers must be able to vent evaporated gas to avoid the risk of explosion. Characteristics and safety considerations for working with cold chain coolants are listed in Table

1. For more information on human safety when working with PREDICT field and laboratory activities, please review the *PREDICT guide to* ***Biosafety and PPE Use (Section 4.)***.

Table 1: Characteristics and safety considerations for PREDICT cold chain coolants.

Coolant	Characteristics	Use and Maintenance	Safety Considerations
Ice Packs	Ice packs are water filled packs that obtain the temperature of a standard freezer (approx.-18°C). **Ice packs DO NOT achieve temperatures sufficient for the preservation of PREDICT biological samples.**	Ice packs must be kept in a freezer for 12-24 hours to achieve maximum coldness. Keep at a temperature colder than the freezing point of the ice pack, to ensure longer cold life.	None (water-based product). Do not chill ice packs used for samples in refrigerators or freezers used for food and beverages.
Gel Packs	Gel packs consist of a liquid blend of chemicals that depress the melting point of a cold pack allowing the gel pack to remain colder than 0°C for longer time intervals than an ice pack. **Gel packs DO NOT achieve temperatures sufficient for the preservation of PREDICT biological samples.**	Before purchase, request documentation from the manufacturer to validate manufacturer claims on the product's cold life, and to obtain instructions on appropriate use of the product, including packaging a cooler with biological samples and the gel packs. Gel packs take at least 24 hours to reach their lowest temperature and can take even longer if chilled in a domestic refrigerator.	Though most gel packs are non-toxic, be careful to not ingest gel from ruptured gel packs. Consult manufacturer guidelines for product use on safety.
Dry Ice	Dry ice is the solid form of carbon dioxide (CO_2), and is approximately -78.5ºC. In ambient conditions, dry ice is unstable and evaporates quickly. Therefore, samples packed in dry ice should be transferred to a <-80º container within 24 hours. **Dry ice is recommended as a SHORT-TERM COOLANT ONLY**, to be used for transporting samples from the field to more reliable temperature controlled storage containers.	Dry ice is easily manufactured, often as a byproduct of other processes, and is widely used in the food industry for preservation. Dry ice can frequently be sourced from breweries, importers of frozen products like ice cream, and meat processing facilities. Any specimens transported on dry ice must be placed in specially insulated containers capable of venting gaseous CO_2. Note: sealing seams of containers like Styrofoam cold boxes prevents ventilation of the gas and can lead to unsafe pressure build-up.	Wear insulated gloves. Always work in well-ventilated areas. Always transport dry ice in containers approved for transport, ensuring that the CO_2 can diffuse minimizing pressure build-up.

Liquid Nitrogen (LN2)	LN2 is a readily transportable and highly effective compound used for the cryopreservation of blood, reproductive cells, and other biological samples and materials. LN2 is produced through the distillation of liquid air, and is stored and transported in vacuum flasks insulated from ambient heat.	LN2 can often be locally obtained through international airports (urban areas), and services that work with artificial insemination (beef/dairy industry located primarily in rural areas). LN2 boils at -196°C, and can cause rapid freezing on contact with living tissue, and severe damage to materials if spilt.	Wear insulated gloves, a thermal apron and a face shield. Always work in well-ventilated areas. LN2 tanks feature pressure relief devices, which if not routinely checked and properly maintained can fail resulting in tank explosion and considerable damage. Consult the manufacturer's recommendations for tank maintenance to ensure compliance. Transporting LN2 tanks or dewars inside project vehicles can be dangerous: there is a risk of rupture or tank failure, and the tanks can potentially explode. When possible, transport LN2 in dry shippers or vacuum flasks approved for transport. If using LN2 tanks or dewars, be sure to secure these containers on the exterior of the vehicle to maximize safety in transport. LN2 tanks should only be placed in an upright position.

Containers for Cold Chain Transport and Shipping

There are two main types of LN2 containers: dry shippers (vapor shippers) and vacuum flasks (dewar flasks). The insulating capacity of LN2 containers varies considerably from a few hours to weeks, requiring constant vigilance for signs of leakage, and routine assessment of container temperature.

Dry shippers (vapor shippers)

Dry shippers are large vacuum containers that contain an absorbent material to hold LN2. A properly prepared dry shipper does not contain any free LN2, and can safely store samples at the optimal temperature range for a period of 24 hours to several weeks depending on the type. Dry shippers are highly recommended for sample storage when samples need to be transported or shipped (bicycle, car, airplane, etc.). Because of their transport utility, dry shippers are often smaller and more compact, and well suited to more short-term storage applications.

Vacuum (dewar) flasks

Vacuum flasks are non-pressurized LN2 containers lacking absorbent material, in which biological samples or specimens are suspended in LN2 within the container. Vacuum flasks should not be used to transport or ship biological specimens. Rather, vacuum flasks are suited

for longer-term storage application (storage time dependent on size of the flask – consult the manufacturers guidelines) in laboratories, field offices, or other locations where samples are expected to reside for longer period of time. Vacuum flasks come in a range of sizes from small to very large capacity containers.

Recommended steps for using dry shippers/vacuum flasks:

- Always consult and follow the manufacturer's instructions for filling, as procedures for each type of container can vary.
- Always wear a face shield and insulated gloves made for handling liquid nitrogen.
- Always work in well-ventilated areas, as a significant amount of nitrogen gas will be generated as the cold liquid contacts the warm surfaces inside the shipper.

Refrigerators and Freezers

Domestic (e.g., household/home) refrigerators and freezers are designed and built for food and drink storage; they do not meet the requirements for sample storage, and do not reach the temperature levels needed for preservation of PREDICT biological material (e.g., specimens for viral screening). **DO NOT STORE SAMPLES IN REFRIGERATORS OR FREEZERS THAT CONTAIN FOOD OR BEVERAGES FOR CONSUMPTION.** In addition, temperature in domestic refrigerators varies significantly with door opening, defrosting, and variable ambient temperatures; they should not be used in a cold-chain for storage of PREDICT samples. Additionally, freezers designated as "frost free" should not be used for sample storage; because the temperature cycling mechanisms they utilize to avoid ice accumulation can damage samples.

Only specially designed ultra-low temperature (< -80°C) commercial freezers are recommended for use with samples when viral isolation is an objective.

Ultra-low temperature (< -80°C) commercial freezers

Commercial freezers come in a variety of temperature settings (-20, -40, -50, -85, and cryogenic freezers at -150°C), and in a variety of configurations (upright, chest, and bench top freezers). It is important to be sure any commercial freezers utilized for biological sample and specimen storage are able to consistently maintain a sub 80°C environment.

Operating a commercial freezer requires a constant source of electricity to maintain temperatures colder than -80°C temperatures and ensure the viability of the cold chain. In many places where PREDICT projects are being conducted, electricity is intermittent and blackouts are common. **It is imperative that the electrical source for a commercial freezer be supported by a back-up generator to ensure continued power for the freezer and viability of the samples.** It is equally imperative that each team has a contingency plan for power outages, to ensure that the back-up generator is functioning and that the freezer remains operational. Teams should clearly mark the power source to the freezer to prevent accidental disconnection, which can cause heat damage if unnoticed over long periods of time. The power source can also be protected by placing a sticker above the power plug or switch, or by installing a lockable

switch. Additional steps on maintaining the cold chain during blackouts are included in Section 3 below.

The location of the freezer in the laboratory or field office impacts performance. Avoid placing a freezer in direct sunlight or near heat sources (hot water or a warm external wall), because that makes the freezer work harder to maintain cool temperatures. In addition, -80°C freezers often require a certain amount of airspace in their immediate surroundings for ventilation and to function efficiently; -80°C freezers should not be located in close proximity to other freezers, equipment, counters, etc. When possible, leave at least 1 meter of space between the -80°C freezer and other freezers or equipment.

Temperature Gauging Equipment

Continual temperature monitoring of the cold chain assures that all samples remain in an optimal environment for preservation. There are a number of methods to monitor cold chain temperatures, from simple thermometers to more complex temperature gauges, cold chain monitors, and data loggers. When combined with an appropriate record keeping system, temperature monitoring provides an ideal method to evaluate the viability of the cold chain and to respond accordingly to any interruptions.

Table 2: Temperature gauging equipment used in the cold chain.

Type	Description	Guidelines for use
Thermometers	Minimum/maximum thermometers are essential equipment for temperature monitoring, and come in two main types: dial and digital.	All thermometers used for temperature monitoring should be set to Celsius, must be reset on a daily basis, and require annual checks to ensure accuracy, as battery failure or damages temperature probes can impact readings. In addition, a temperature-monitoring chart should be maintained to provide a record of variation in temperature that may indicate problems with the freezer or thermometer.
Temperature Chart Recording Systems	Temperature Chart Recording Systems are automated systems that record temperature and provide visual or audio alarms at signs of malfunction.	These systems are fully automated and provide digital output of temperature variations over time. These are typically after-market modifications to freezers, and if installed, should be verified to function with the freezer manufacturer as they may void product warranty.
Data loggers	Data loggers are used to record temperature patterns over time by recording temperature data electronically, and providing an electronic and downloadable record.	Data loggers are not a replacement for manual monitoring, and daily minimum and maximum temperatures should still be recorded to ensure the maintenance of the cold chain. When used for routine temperature monitoring, a data logger must be equipped with a visual min/max temperature display to allow for daily real-time recordings.

Cold chain monitors	Cold chain monitors generally consist of dual-time temperature indicators (WarmMark™ and MonitorMark™) and function by displaying changes in temperature through color change on an indicator strip. Other types of cold chain monitors include freeze indicators (Freeze Watch™, ColdMark™) consisting of color bulbs that release a dye at a threshold temperature. There are also combined indicators featuring dual time-temperature indicators and freeze indicators.	Cold chain monitor color change allows for an estimation of the amount of time a temperature exceeds a pre-determined threshold. No color change means the cold chain was not interrupted and temperature remained safe for sample transport. Note: these monitors are often for temperatures warmer than -80°C (e.g. cold boxes/coolers, refrigerators, -20°C freezers) and are often not designed for samples kept at or colder than -80°C.

Management of Cold Chain Equipment.

Procuring the needed equipment is only one aspect of keeping a functional cold chain. Equipment management and maintenance is equally important, and requires:

- Maintaining an equipment inventory
- Planning and budgeting for equipment operation (e.g., electricity), maintenance, and repair
- Planning and budgeting for equipment replacement
- Emergency response or contingency planning in the event of cold chain breach or equipment failure

Equipment Inventory

An inventory should be developed to track all equipment, tools, and parts that are used as part of the cold chain. A good inventory will allow team members to track the location of all materials used in the cold chain, schedule maintenance and repair, arrange for replacement and evaluate the project supplies. Table 3 includes some information recommended for a sample storage equipment inventory.

Table 3: Sample storage equipment inventory database example.

Item	Specifications (brand, model, SN, date of acquisition)	Current Location	Current Condition (Working, Under repair, Out of commission)	Date of purchase – warranty number	Estimated Replacement Date	Notes
Ultra-low freezer	TS Revco ElitePlus, S/N 007054568, Oct. 2010	Morogoro	Working	September 2010	October 2013 (MFR warranty expiration)	Recently purchased and installed
Dryshipper	MVE Cryomoover, S/N 9989900745, Oct. 2010	Serengeti, PREDICT Mobile team	Working	September 2010	October 2013 (MFR warranty expiration)	Field sampling with TAWIRI team
LN2 Generator	StirLITE, S/N 356777456, Oct. 2010	Iringa, PREDICT office	Out of Commission	September 2010	October 2013 (MFR warranty expiration)	Installation issues: working with support services to resolve; sourcing LN2 from supplier in Dar es Salaam currently.

Equipment Operation, Maintenance, and Repair

All equipment requires maintenance to protect against failure and degradation. Maintenance planning involves identifying procedures and plans to keep equipment functioning properly, as well as planning for emergency repair in the event of equipment failure. Some equipment requires routine maintenance (daily, weekly, or monthly), while others may require maintenance following use (dry shippers, vacuum flasks, cold boxes, etc.). Maintenance instructions are usually included with the equipment, and can often be obtained from the manufacturer. It is important that team members receive training in routine maintenance and repair within reason, while skilled technicians should be identified for complex maintenance and repair procedures.

In addition, it is important to estimate the costs of installing, operating, and maintaining the equipment. Ultra-low temperature freezers utilize significant quantities of electricity, though newer models are designed to minimize power consumption. It is possible that the installation of new equipment will drastically increase power consumption requiring a re-budget of operational costs.

You may use the following equation to estimate the cost of your electrical equipment using the manufactures specifications to obtain the value for kilowatt hours (kWh). [kWh / 24 h] x [kWh costs in your location] x [365 days] = Operational Cost / Year

Maintenance of equipment over time will also require a budget, and should be included in operational cost planning.

Equipment Replacement

Equipment will eventually wear out, and if plans are not in place to address equipment failure, a significant cold chain breach may occur (See Section 6.1.3.). It is important that teams understand the lifecycle of all cold chain materials and equipment, and that plans are in place to address equipment failure when it occurs. Most manufacturers provide estimates of equipment life expectancy. When developing the equipment inventory, estimated replacement dates should be included in documentation to assist in replacement planning. As equipment can often take months for order and delivery, temporary cold chain storage plans should be considered to ensure no breach or interruption.

Emergency Planning

Cold chains are fragile, material dependent, and subject to interruption through breakdowns of background infrastructure (electricity failure) and equipment failure (leakages of cold storage containers or freezer malfunction). Team members must set up emergency planning for identifying equipment failure early, along with arrangements for maintaining the cold chain during repairs or replacement. Equipment outages caused by shortages of spare parts or materials should not occur.

Power surges and "brown-outs" are often frequent occurrences in areas where PREDICT teams are active. A brown-out is a drop in voltage in an electrical power supply, most commonly observed by the dimming of lights. Black outs are covered below in the Section 6.1.3.. To prevent adverse impacts to cold chain equipment during power surges, it is imperative to have stand-by generators, back-up power sources, and other mechanisms in place (surge protectors, CO2 backup systems, etc.). Often electrical equipment is sensitive to undercurrent (for example a 220V system running at 205V temporarily), and equipment failure and destruction is possible.

Section 6.1.2b. Recommended Temperature Requirements for Sample Transport and Storage

An essential component of cold chain planning is knowing the optimal temperature requirements for different diagnostic methods, sample types and storage media.

For PREDICT purposes all samples (stored in VTM and Trizol) must be frozen in liquid nitrogen immediately in the field and transferred to a -80°C freezer once back in the lab. If the location of the field site allows, you may use short term (maximum 48 hrs.) refrigeration (i.e., ice/gel packs) prior to transfer to -80°C freezer or LN2 dewar.

ONLY if there is no **short term** access (i.e., within 24 hours) to cold chain such as in an emergency situation samples can be collected in 200 µL of RNAlater instead of Trizol and VTM. Storage times and temperatures for samples in RNAlater are as follows: 1 day at 37°C (i.e., room temperature), 1 week in the refrigerator, and transfer to -80°C for long term storage as soon as possible and within 1 week until analysis.

Do not collect samples onto dried blot spot cards.

Section 6.1.2c. Cold Chain Initiation at the Sampling Sites

Following collection in the field, samples must be immediately introduced to the optimum temperature range. When possible, collected samples should be initially stored in cryotubes allowing for immediate introduction to the cold chain and minimizing any freeze/thaw issues involved in sample transfer at a later time.

Table 4 provides an overview of temperature ranges used in PREDICT activities, along with procedures for optimizing these ranges for short-term storage. This table is followed by recommendations on the use of referenced equipment.

Table 4: Maintenance of transit temperature by optimum temperature range.

4°C *Commercial Refrigerator or "on-ice"*	**-70°C** *Dry ice*	**-80°C or colder** *LN2*
Time interval: 1-2 days (chilled). Limit to a minimum	Time interval: 1-2 days (frozen).	Time Interval: Indefinite (as long as LN2 quantities are maintained)
*Procedure: The sample transport container (cold box or cooler) should be fitted with as many ice/gel packs as possible. Temperature should not exceed 4°C. If available, a cold chain monitor should also be inserted.	*Procedure: Place a minimum 1 kg of dry ice per 1 kg of samples (but double or triple dry ice amount if possible) for every 24 hours in transit. Place in a sturdy Styrofoam container, allowing for release of carbon dioxide gas to prevent explosion. Use solid dry ice cubes when possible as their duration greatly exceeds that of chips or snow.	*Procedure: Place samples into special cryotubes with screw-down lids (no snap-tops). Cryotubes are then inserted into a LN2 "charged" dry shipper or vacuum flask.

**Maintain at least 4 frozen gel packs and an additional transport container as a contingency plan in case of package or container failure with dry ice or LN2.*

Using temporary cold boxes or coolers

Insulated cold boxes or coolers may be used for sample transport of less than 48 hours duration for all samples requiring storage at -80° C or if no LN2/dry ice supplies are available, or during equipment failure or emergency maintenance periods.

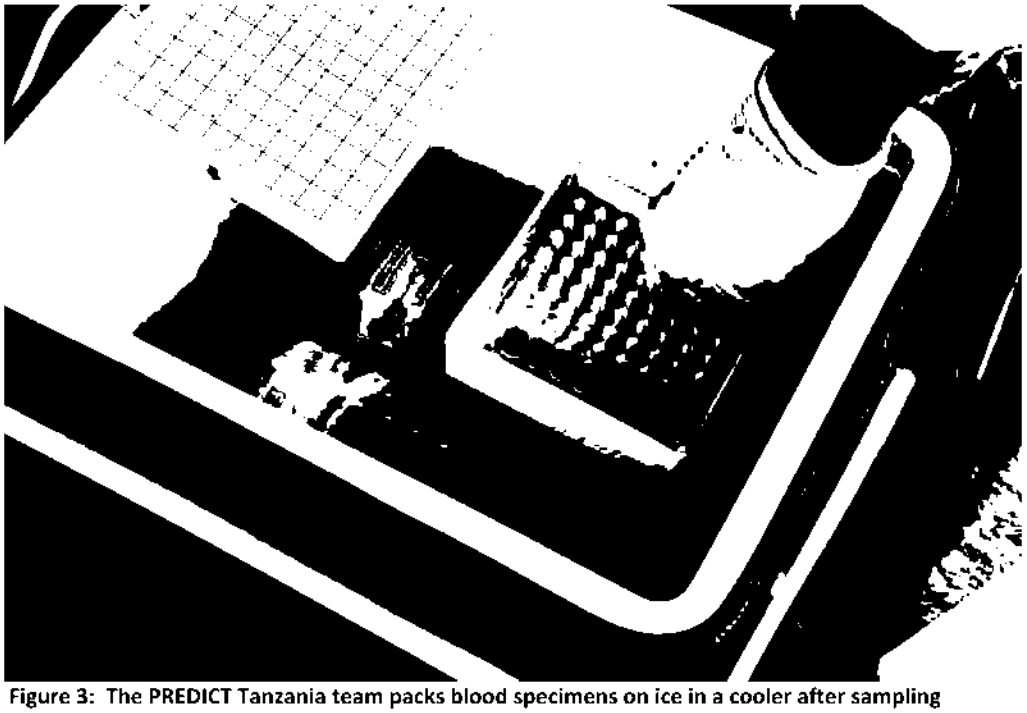

Figure 3: The PREDICT Tanzania team packs blood specimens on ice in a cooler after sampling rodents. Other specimens from field collection were stored in LN2 consistent with sample storage guidelines (Table 6). Photo by Liz Vanwormer.

Recommended steps when using cold boxes or coolers:

- Samples must be protected from heat, sunlight and fluorescent light at all times.
- Check the temperature in the cold box using a mercury or digital thermometer every 3 hours. Note: repeated opening and closing of the cold box will cause temperatures inside the box to elevate more rapidly. Teams must use good judgment when deciding to monitor the cold box temperatures.
- Rotate ice/gel packs to maintain maximum coldness within the container. If possible have extra ice gels to replace thawing or thawed ones.
- Do not transport samples in the trunks of vehicles (or the floors of some vehicles) due to the risk of exposure to temperature extremes. Be familiar with the coolest part of the vehicles.
- Do not remove samples from cold box or cooler until ready to transfer to recommended vacuum flask, dry shipper, or commercial freezer.
- When transferring samples, do not leave them out on the counter or the floor subjected to room temperature and light.
- Keep records of amount of time samples were stored at temperatures warmer than -80°C, and record the date and time when samples were introduced to the -80°C cold chain.

Using containers with dry ice

Dry ice (-78.5°C) is colder than ice and gel packs and allows for maintenance of samples frozen in transit. Any specimens transported in dry ice must be placed in specially insulated containers capable of venting gaseous CO2.

Recommended steps when using dry ice:

- Pack samples in a good insulated container. Thick polystyrene/styrofoam boxes work well with dry ice as they allow for the necessary off gassing of CO_2 (release of CO_2 gas) and are durable enough to last through transport.
- Sufficient dry ice is needed for maintaining samples consistently frozen. If dry ice quantities are insufficient samples will thaw and rendered useless.
- Use a minimum 1 kg of dry ice for each **1** kg of samples for every 24-hour transit period. Keep in mind however that depending on the quality of your shipping container and environmental conditions you will need to adjust these quantities to ensure constant temperatures. In hot conditions and whenever possible use double or triple the recommended dry ice quantity (i.e., 2 or 3 kg dry ice per kg of samples). For longer than 24 storage/transit times, double the amount of dry ice.
- When packaging items, place dry ice and sample containers as close together as possible and cover with additional dry ice. Fill any empty space with newspaper (ideal) or cloth, bubble packs, or Styrofoam peanuts. Empty space allows the dry ice to sublimate (change from liquid to gas) more quickly.
- Dry ice blocks take longer to evaporate and are better at maintaining samples frozen for longer storage/transit periods. However, samples must be close to dry ice (or surrounded by it) for adequate preservation. Solid blocks of 2-3 kg are ideal, yet not always available. Avoid using "snow" or chip dry ice whenever possible as they evaporate very quickly.

Using dry shipper or vacuum flask storage (LN2)

Dry shippers and vacuum flasks when properly charged provide ideal low temperatures for preservation of PREDICT samples both in the short-term following sample collection, in transport, and in the long-term as samples await analysis and/or shipping for diagnostics.

Recommended steps for filling dry shippers/vacuum flasks for sample transport:

1. Use appropriate PPE!
2. Add the LN2 slowly into the container.
3. Stop filling the container when the liquid reaches the neck of the dry shipper. (**DO NOT OVERFILL**)
4. Then, attach the cap and set the container aside to saturate the absorbent for the period specified by the manufacturer. This is called "charging" the container.
5. Repeat the steps above until the liquid level no longer drops on standing (e.g. the container is "charged"). Some manufacturers provide empty and full weights for their containers. If the dry shipper will not reach the expected full weight specified by the manufacturer, there may be a problem with the absorbent's ability to hold the LN2, and could indicate the container is compromised, and that samples transported or stored in the container may be at risk of degradation. In this case, contact the manufacturer or supplier of the equipment to assess whether the container is fit for use with biological samples.
6. Remove all free liquid nitrogen from the container prior to transport.
7. Empty the container by pouring the excess liquid nitrogen back into a large LN2 vacuum flask.
8. If the LN2 cannot be poured back into the flask, pour the LN2 into an appropriate area.
9. Do not pour LN2 onto the floor or onto hard surfaces. LN2 can crack and destroy concrete and other hard surfaces, and the liquid could splash onto your shoes or legs and cause severe burns.
10. Ensure that any area where LN2 is poured away is well ventilated. Remember that handling or spilling LN2 in a small, confined space has been known to cause fatalities via asphyxiation /displacement of oxygen. Appropriate safety precautions outlined in the Protocol above must be considered.
11. After pouring out excess LN2, hold the dry shipper or vacuum flask upside down to be sure that all liquid has stopped flowing.
12. Stand the dry shipper upright for the period specified by the manufacturer.
13. Repeat the LN2 removal steps as many times as necessary to make sure there is no excess LN2 in the container.
14. Put the samples into the dry shipper/container and replace the cap.
15. Record the date, time, and ID of the samples for when they were placed into the container to initiate the cold chain data log.
16. Ready the dry shipper/container for transport by securing the container in the vehicle. If using a protective bin for the container, then secure the container in the bin first, before securing the bin in the vehicle.

Recommended steps for using dry shippers or vacuum flasks for sample storage:

- Make sure containers are fully charged prior to deployment in the field or removal from dry ice/LN2 source (See steps on filling shippers/flasks above).
- Make sure containers are not leaking.
- Make sure to have sufficient quantities of LN2 on hand for sample storage and emergencies.
- Develop a plan for obtaining additional dry ice/LN2 supplies in the event of emergency or container failure.
- When in the field, always keep additional cold boxes with conditioned (e.g., properly prepared) ice/gel packs as back up in event of container failure.
- Following sample collection, organize samples in the containers according to animal or sample ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from containers only when ready to prepare for analysis or shipping.
- Record the length-of-time samples were kept in containers and document the number of times and duration containers were opened.

Figure 1: The PREDICT Tanzania team packs up equipment after collecting specimens from rodents. The mushroom shaped container in the background is a specially designed transport container for LN2 dryshippers, ensuring the dryshipper container is well protected during overland or air travel, and that all stored specimens are well within the temperature range required for viral isolation. Photo by Liz Vanwormer.

Section 6.1.2d. Sample Transport

Following sample collection, it is imperative that the field teams coordinate with the receiving laboratories or PREDICT Country Coordinators on all details involving sample transport and storage planning. In many cases, samples will be delivered from the field/collection site to a temporary storage facility prior to shipment to end-use processing laboratories, and may involve multiple phases of the cold chain. In the event of international transport of samples to a processing laboratory, all PREDICT personnel must follow the guidelines specified in ***Section 6.2 Packing and Shipping Biological Samples*.**

All sample transport containers must be secured (e.g., tied down) in the transport vehicle. If possible, LN2 dryshippers should be secured in a separate compartment space from the passengers (e.g., rooftop bin or a covered canopy of a flatbed truck), and equipped with a spill kit containing absorbent materials to protect personnel from any accidents involving spillage. Non-LN2 containers with unprocessed samples may be secured in the project vehicle with proper secondary containment to minimize sample jostling during transport. There is a risk that containers may leak during transport, so it is imperative that teams understand the risk of asphyxiation in a closed vehicle and be prepared to address any spills and leakages with appropriate equipment. **PREDICT vehicles should be equipped with cold chain PPE (e.g., disinfectant, heavy reusable gloves, disposable gloves, mask, apron, goggles, and a sealable and leak proof disposal container) to respond to any incidents involving sample spillage**. To ensure maintenance of the cold chain, additional ice/gel packs, dry ice and appropriate containers, or an additional LN2 dry shipper should be available to prepare for travel delays or primary container failure.

Section 6.1.2e. Safe Storage of Samples

Upon delivery of samples from the field, it is the responsibility of the receiving party to ensure that cold chain is continued and samples are appropriately stored, documentation transferred (See Section 6.1.3.. Records below), and Country Coordinator or other supervisor notified. **For PREDICT purposes ALL SAMPLES must be stored frozen at -80°C or lower temperatures.**

Additional Sample Storage Guidelines

- Samples should be divided or aliquoted into the smallest useful units during initial processing in order to avoid excessive freeze-thaw cycles, and to avoid damage leading to a loss of infectivity.
- When samples are removed from cold storage and shipped to a laboratory facility for analysis, teams should follow the PREDICT training guidelines on ***Packing and Shipping Biological Samples (Section 6.2)***.

Long-term Sample Storage

It is strongly recommended that all samples kept for long-term storage be maintained at temperatures at or below -80°C. This can be achieved either through the use of large capacity LN2 dewars or through ultra-low temperature freezers.

Using Liquid Nitrogen

There are generally two types of sample storage systems available for LN2 dewars: box/rack (or canister systems) and cane/straw systems. While cane/straw systems are acceptable for short-term storage, it is highly recommended that samples for long-term storage be kept in box/rack systems, which allow for quick retrieval and identification with minimal temperature reduction upon retrieval. Cane/straw systems have less storage capacity and often increase the amount of time required to locate samples for pathogen testing.

Recommended steps for using LN2 in long-term sample storage:

- Make sure containers are filled to capacity, functioning properly, and are not leaking.
- Develop a plan for obtaining additional LN2 supplies in the event of emergency or container failure.
- Maintain a supply of ice/gel packs to maintain temperature in the container in the event of container failure, or for use in emergency storage or transport.
- Organize samples in box/rack systems according to animal or specimen ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from containers only when ready for testing or shipping.
- Record the length-of-time samples were kept in containers and document the number of times and duration containers were opened.

Using Ultra-low Temperature Freezers

Like samples in LN2, samples stored in ultra-low temperature freezers (-70/80°C and colder) must also be easily identifiable and organized in a way to minimize the time required for sample location and access. Freezers must be well managed, and staff must be prepared for disruption of electricity, blackout, or other event where the freezer malfunctions.

Recommended steps for using ultra-low temperature freezers:

- Store material in the freezer leaving space between boxes/containers to allow for air to circulate.
- Organize samples according to animal or sample ID consistent with PREDICT sample tracking recommendations for rapid retrieval.
- Remove samples from freezer only when ready to prepare for testing or shipping.
- Minimize the number of times the freezer is opened, and make sure the freezer door is closed tightly.
- Secure the electrical outlet and freezer plug to prevent accidental disconnection and freezer failure.
- Post a highly visible sign or sticker by the electrical outlet to ensure the freezer is not unplugged, or cover the electrical outlet with a cage to prevent disconnection.
- Maintain a supply of ice/gel packs in the freezer to maintain temperature in the event of freezer failure, and for use in emergency storage or transport.
- Employ a temperature monitoring system.
- Train all staff members in monitoring and documenting temperatures.

Section 6.1.2f. Cold Chain Maintenance

Checking, Recording and Monitoring Cold Chain Temperature

Implementing a temperature-monitoring plan through consistent and regular thermometer readings is essential to maintaining a secure and reliable cold chain.

Recommended Steps for Cold Chain Temperature Monitoring:

- Check LN2 levels and container temperature (if using gauge), and ensure that the container is not leaking twice per day in the mornings and evenings.
- Check and record freezer temperature twice per day in the mornings and evenings (Figure X) as follows: (Note: these readings must be done more frequently if samples are temporarily stored in cold boxes or coolers).
    - Check and record the current freezer temperature.
    - Check and record the maximum freezer temperature.
    - Clear the maximum reading after it is documented.
    - Check and record the minimum freezer temperature.
    - Clear the minimum reading after it is documented.
    - Reset the thermometer.
- Do not open the freezer door to take the temperature readings; an external temperature gauge should be used for commercial freezers.
- Change the thermometer or temperature gauge battery every 6 months (i.e., seasonally with the time change) or as recommended by the manufacturer, as a low functioning battery may give false temperature readings.
- Keep a supply of spare batteries in case of device failure.

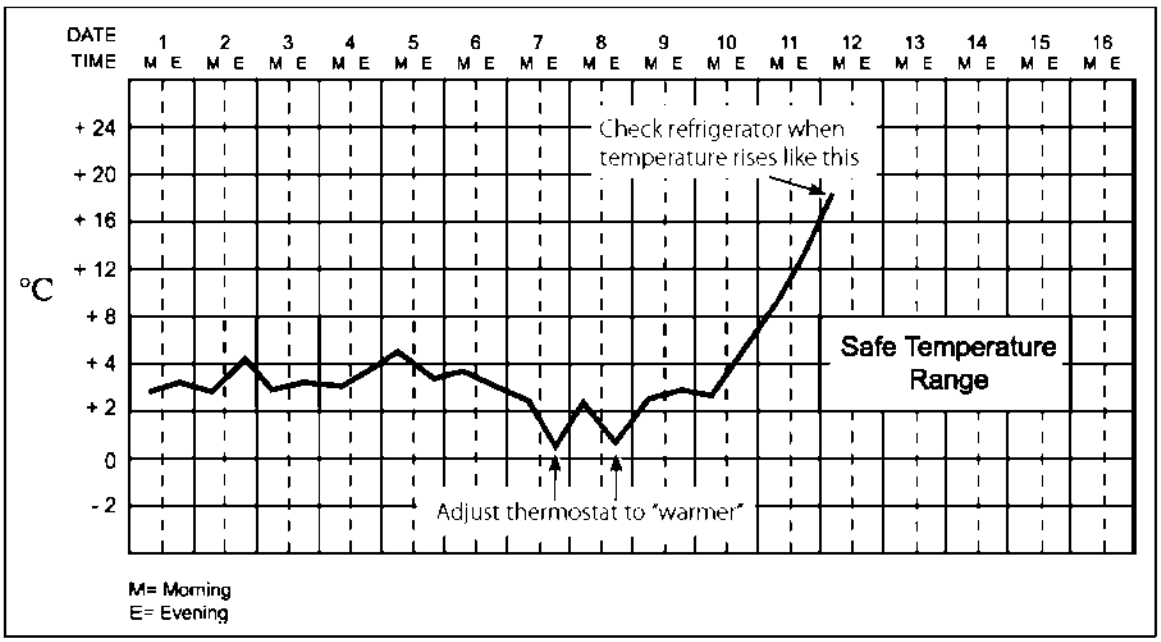

Figure 5. An example of a cold chain temperature monitoring chart. Source: WHO, 2004.
Note: this chart is for a cold chain optimized for vaccines at 2-8ºC. Use the chart included in the Appendix for the PREDICT cold chain at lower storage temperatures optimal for viral isolation.

Section 6.1.3. Contingency Planning and Responding to a Cold Chain Breach

Preserving and maintaining below freezing temperatures in tropical conditions requires attention to detail and intensive logistical planning, linking equipment, people, policies, and procedures into an integrated system. Country coordinators, laboratory technicians, and field personnel all have a role to play in ensuring that PREDICT samples are collected, transported, stored, and shipped (if necessary) without breaks in the cold chain. In addition, team members must be trained and prepared to address incidents in which there is a cold chain breach, to enact response measures for rapid cold chain rehabilitation.

Contingency Planning

It is imperative that all PREDICT teams have a pre-determined contingency plan for maintaining the cold chain in the event of freezer or container malfunction or electricity disruption. It is highly recommended that all facilities using commercial -80°C freezers be linked with a back-up generator for continued electrical operation (see box below). However, it is the team's responsibility to make sure that the back-up generator is of sufficient capacity to operate the freezer, is functioning and has sufficient fuel to maintain electricity, or that alternative measures for maintaining the cold chain are necessary. Arrangements with other facilities for temporary sample storage (if necessary) should be made in advance, along with plans for rapid sample transfer with minimal cold chain disruption.

Essential Steps in Setting-up your Back-up Generator System

Generators should be connected to freezers before a power failure to determine:

a) If the generator can effectively operate the freezer
b) The temperature at which the freezer operates when connected to the generator, and whether an appropriate temperature is maintained for samples over an extended period of time
c) How long the generator can be used in the event of a power outage

If these three conditions are met, then the generator is sufficient to act as a back-up system in the event of a breach. If these conditions are not met, please see "Recommended Steps for Contingency Planning" below.

Recommended Steps for Contingency Planning:

- Identify possible sources of cold chain interruption or breach (e.g., equipment failure, supply shortages, power outages, etc.).
- Identify preparations and solutions for possible chain interruptions
- Prepare back-up infrastructure for sample storage.
- Identify alternate storage facilities for samples and initiate communication to facilitate emergency use.
- Monitor and evaluate equipment regularly and maintain records to assist in understanding potential weaknesses in the cold chain.
- Ensure staff are trained on cold chain maintenance and monitoring for prevention of a breach.

Recommendations for a Power Failure Contingency Plan

Power Failure Contingency Plan (Example)

Start-up the Generator! If Generator is not working, or is insufficient to provide adequate backup (See Box above), then proceed with these steps below:

Samples stored in refrigerator

Monitor the temperature of refrigerator (temperature gauges should be battery powered).

During a power failure of 4 hours or less, the refrigerator door should be kept closed at all times.

If samples are at risk of warming, implement alternative storage arrangements. All samples must be transferred to cold boxes/coolers with prepared ice/gel packs. Monitor sample temperature through the use of a thermometer probe placed near the samples inside the cold box or cooler.

Samples stored in commercial freezer

Monitor the temperature of freezer (temperature gauges should be battery powered).

If samples are at risk of thawing, implement alternative storage arrangements (either in dry ice or LN2, or in cold boxes and coolers with prepared ice/gel packs).

Responding to a Cold Chain Breach

A cold chain breach is an interruption in the cold chain exposing samples to temperatures above the required range for viral preservation (for prolonged periods – opening and closing a freezer door will often cause temperature fluctuation, but does not qualify as a "breach"). If not quickly rehabilitated, such an interruption can destroy sample viability and render samples useless for PREDICT pathogen testing activities. It is imperative that all teams have documented plans for addressing a breach in the cold chain, and that all team members have received training on appropriate response and cold chain rehabilitation.

Recommended steps in responding to a cold chain breach:

1. Contact your PREDICT Country Coordinator (or supervisor) as soon as possible for advice on emergency response measures, and consult your contingency plans.
2. Define the incident: check all temperature monitoring records, equipment, and discuss with staff possible explanations for the breach.
3. Confirm accuracy of equipment by referencing manufacturer specifications to ensure that the breach is not simply equipment malfunction (data loggers, cold chain monitors and temperature gauges may have operational failure. It is important that emergency measures are not implemented until staff is certain the failure is with the freezer or storage container).
4. Assess the condition of the freezer/storage container. Can the cause be identified (e.g., leaky dewar, freezer door no longer closing completely)?
5. Record:
    a. When the cold chain was last guaranteed?
    b. What monitoring has been recorded prior to breach?
    c. What is the time interval of breach?
    d. What is the temperature range of the breach period?
    e. What samples were involved in incident? Enter record in sample database.

6. Continuously monitor temperatures of the containers/freezers and record the duration of time samples are exposed to temperatures warmer than -80°C.
7. If temperatures approach -30°C, begin planning for sample transfer to temporary cold boxes or coolers, or other laboratory facilities.
8. If temperatures climb to warmer than -20°C, transfer samples to temporary storage containers and continue monitoring temperature. If there is no -20°C capacity, actively pursue an alternative storage facility and prepare insulated boxes for sample transport.
9. DO NOT discard any samples until advice has been sought from PREDICT Country Coordinators and laboratory personnel.
10. Label all samples exposed to elevated temperatures in the PREDICT sample tracking information database.

Take active steps to correct and prevent the problem from recurring.
In the event of a cold chain breach, it is important to keep records to guide in response implementation, to help prevent future breaches, and to inform PREDICT team members of any potentially affected samples. The following table includes an example data sheet for a cold chain breach. A blank data sheet is included in the Appendix.

Example data sheet for cold chain breach

Date and suspected time of the breach	Date: Aug. 13, 2010	Time: 5:14 PM
Do you store your samples in a commercial freezer or vacuum flask container?	Commercial Freezer	LN2 vacuum flask
Minimum and maximum temperature readings	Minimum: -88°C	Maximum: -57°C
When was the thermometer last reset	Dave of reset: July 12, 2010	Time of reset: 11:12 AM

Section 6.1.4. References

Commonwealth of Australia, Department of Health. 2003. *Cold Chain and Immunization Operations Manual: Guidelines for handling heat sensitive vaccines and pharmaceuticals.*

Commonwealth of Australia. 2005. *National Vaccination Storage Guidelines: Strive for 5.* ISBN: 0 642 82750 8.

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World Health Organization Epidemic and Pandemic Alert and Response. 2006. *Collecting, preserving and shipping specimens for the diagnosis of avian influenza A(H5N1) virus infection: Guide for field operations*. WHO/CDS/EPR/ARO/2006.1

World Health Organization Department of Communicable Disease Surveillance and Response. 2000. *Guidelines for the collection of clinical specimens during field investigations and outbreaks*. WHO/CDS/CSR/EDC/2000.4.

World Health Organization Department of Immunization, Vaccines, and Biologicals. 2004. "Ch. 3. The Cold Chain Module." In *Immunization in Practice: A practical resource guide for health workers (CD)*. World Health Organization.

Section 6.1.5. Appendix I. Datasheets and Checklists for Cold Chain Planning and Implementation

Equipment Inventory Template

Item	Specifications (brand, model, SN, date of acquisition)	Current Location	Current Condition (working, in repair, out of commission)	Date of Purchase	Estimated Replacement Date	Notes

Equipment Maintenance Record Template

Model No.	Serial No.	Purchase Date	Last Service Date	Work (Maintenance) Performed

**Note: It is also recommended that teams catalog recommended maintenance forms, registries, and schedules that accompany equipment to help plan for equipment maintenance and minimize interruptions in the cold chain. It may also be helpful to keep a record of responsible team members so staff are aware of equipment maintenance duties.*

Data Sheet Template for Cold Chain Breach

Date and suspected time of the breach	Date:	Time:
Do you store your samples in a commercial freezer of vacuum flask container?	Yes	No
Minimum and maximum temperature readings?	Minimum	Maximum
Are Cold Chain Monitors (CCMs) stored with the samples? If 'yes', be ready to report the reading when breach was noticed.	Yes	No
When was the thermometer last reset?	Date of reset:	Time of reset:
When was the thermometer battery last changed?	Date of battery change:	Time of batter change:
When was the last check on the accuracy of the thermometer done?	Date:	Time:
How long do you think the temperature was above -80°C?	Minimum Estimate	Maximum Estimate:
How long do you think these problems have been occurring?	First breach	Recurring (state number):
Where is the temperature probe situated?	Location:	Notes:
What type and number of samples were exposed to the breach?	Type of samples:	Number of samples:
Are all samples labeled and accessible?	Yes	No
Are there ice/gel packs in the freezer to use if transfer is necessary?	Yes	No
What do you think was the cause of the cold chain breach?	Suspected cause:	Notes:
Has the cause of the cold chain breach been rectified?	Yes	No
Free fields for customization		

Temperature Monitoring Chart (-80°C and ultra-low temperature freezers).

Date	1		2		3		4		5		6		7		8		9		10	
Time	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E	M	E
-30																				
-40																				
-42																				
-44																				
-46																				
-48																				
-50																				
-52																				
-54																				
-56																				
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-60																				
-62																				
-64																				
-66																				
-68																				
-70																				
-72																				
-74																				
-76																				
-78																				

M=Mornings; E=Evening

Red: *Critical zone above freezing temperatures;* ***Green:*** *Safe zone for PREDICT samples;*

Yellow: *Temperature zone indicating thawing of samples and potential breach.*

Note: This Chart will produce a visible trend from dot plots of temperature like in Figure 6, showing your equipment's temperature variation over time. You may customize the temperature column to use with other temperature ranges as needed. This form will need to be replaced every 10 days (with dates adjusted in the "Date Column"). If using grey-scale, feel free to remove the color shading and print a simple table format.

TEMPERATURE LOG

Site: _____
Refrigerator ID#:_____ Required Temp: _____
Freezer ID#: _____ Acceptable Range: _____

ENTER TEMPERATURE AND INITIALS DAILY!

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
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21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

NOTE: CROSS OUT WEEKENDS AND HOLIDAYS – UPDATE FOR REMAINING MONTHS.
**This is a sample template for use with refrigerators and other equipment; it can be used together with the "Temperature Monitoring Chart" above.*

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Section 6.3. Basic Laboratory Safety

Prepared by
Tracey Goldstein, University of California Davis,
Simon Anthony, Columbia University,
Carlos Sanchez, Smithsonian Institution,
and the PREDICT One Health Consortium

Objective: To provide a safe and healthy environment for staff, volunteers and all personnel involved in PREDICT activities. This Guide is to provide basic information to ensure a safe laboratory environment and to comply with environmental standards. The recommendations in this Guide are consistent with the requirements of the U.S. Occupational Safety and Health (OSHA) Act of 1970, Executive Order 12196.

This document was made possible by the generous support of the American people through the United States Agency for International Development (USAID) Emerging Pandemic Threats PREDICT program. It was drafted to support activities conducted under PREDICT and is intended for an audience of qualified professionals trained in standard, associated best practices. This guide is not intended for use by untrained individuals.

For more information about the contents of this guide, please contact predict@ucdavis.edu.

Suggested Citation Form: PREDICT One Health Consortium 2016. PREDICT Operating Procedures: Basic Laboratory Safety.

Table of Contents: Basic Laboratory Operations

Section 6.3.1. Learning Objectives

If you understand the material in this Guide, you should be able to:

- Work safely in a basic laboratory environment.
- Recognize laboratory hazards and take the appropriate measures to reduce those hazards.
- Obtain a Material Data Safety Sheet (MSDS) for a hazardous material and explain the kinds of information in an MSDS.
- Explain important precautions to avoid needlestick injuries.
- Explain how to avoid exposure to pathogens in the laboratory.
- Describe the safety measures for a BSL 2 laboratory.
- Explain why medical monitoring of laboratory personnel is important.
- Describe the proper disposal of sharps and medical waste.
- Describe safety procedures for handling chemicals in the laboratory.

Confirm you understand the material of this Guide:
When you are familiar with the information in this Guide, take the PREDICT quiz on ***Basic Laboratory Safety (Section 8.4.16.)***.

This training module is mandatory for all laboratory and field staff.
Once you have passed the quiz please supply proof of training and completion to your supervisor.

Section 6.3.2. Principles

Guiding principles for PREDICT laboratory operations:

1. Prevent loss of life, personal injury or illness, property loss or damage, or environmental harm.
2. Comply with the ***PREDICT Environmental Compliance Protocol*** and local and national safety and health requirements.
3. Comply with applicable local building safety codes.
4. Ensure all PREDICT personnel understand relevant safe and healthy work practices.
5. Identify and assess hazards in the laboratory environment.
6. Establish overall safety and health guidelines that ensure employee safety and health at all times during PREDICT activities.
7. Periodically review and evaluate PREDICT plans, facilities, equipment, and activities to ensure that safety and health objectives are achieved.

Section 6.3.3. General Guidance for Laboratory Safety

This Laboratory Safety Guide describes safe work practices, personal protective equipment, and other control measures necessary for the safe use of chemicals and other hazardous materials

and procedures in the basic laboratory environment. PREDICT personnel involved in laboratory activities must review and follow this Guide. Staff, interns, visiting scientists, and volunteers are to receive this Guide prior to conducting laboratory activities for the PREDICT Program. This Guide will be updated as needed to improve safety procedures.

Ensure Safe Working Conditions

- Inspect your personal protective equipment (PPE), such as goggles and gloves, to ensure that each component fits well and works properly. Examine your gloves for cracks. Nitrile and latex gloves are disposable and a new pair should be used for each task.
- If you are working with PPE kits, ensure that the kit is complete (a list with the contents of the PPE kit should be available).
- Dispose of broken glass and biohazard materials in designated sharps and hazardous waste containers in the laboratory.
- Help provide a safe work environment by keeping the workspace neat and uncluttered.
- Sinks and eye wash stations should be kept clear.
- Wash your hands and forearms after you have removed and disposed of your PPE.

Hazard Identification and Assessment

Personnel should be able to recognize the possible hazards and inherent risks associated with laboratory procedures and equipment.

Table 1: Hazards associated with laboratory procedures

Procedure	Possible hazards	Likelihood of illness or injury	Risk
Using autoclave or hotplate	High temperature	Moderate	Burns
Handling animal and human samples including body fluids, tissues, swabs	Infectious organisms	Low to moderate	Pathogen exposure zoonotic diseases
Reagent preparation	Acids or alkalines Solvents (alcohols, acetone)	Low Low	Burns Inhalation irritant
Disposal of needles and slides	Sharp objects Infectious organisms	Low to moderate	Needlesticks, cuts, zoonotic disease, pathogen exposure
Dry ice, liquid nitrogen or ultra-low freezers	Extreme cold (~-100F)	Low	Burns
Media preparation	Extreme heat	Low	Burns
Formaldehyde	Inhalation of vapors, ingestion of liquid or direct contact with the liquid or vapor (skin, eye contact)	Moderate	Cancer, skin, eye and respiratory tract irritation
TRIzol Reagent (or Tri reagent; phenol solution)	Toxic if inhaled, absorbed through skin or ingested; reacts with bleach	Moderate	Contact burns, systemic poisoning; creates toxic gas if mixed with bleach

Safe Laboratory and Operating Procedures

Personnel must understand and follow the safe operating procedures of laboratory equipment and PPE to minimize health and safety risks. **The use of the PPE for specific laboratory tasks, listed in Table 2, is mandatory** and all PREDICT personnel must follow the special precautions listed for handling highly hazardous materials.

Table 2: PPE required for laboratory tasks

Lab Task	Health or Safety Hazards	Required PPE	Precautions for Highly Hazardous Materials*
Handling all samples from animals and humans (body fluids, tissues, swabs)	Zoonotic disease potential	Lab coat, closed shoes, disposable nitrile gloves, eye protection and respirator (N95 minimum)	Use of Biosafety Cabinet Class II and eye protection for samples known to be highly infectious or use PPE kits.
Handling acids or chemicals that are irritants (i.e. formaldehyde)	Respiratory irritation, acid or alkaline burns	Lab coat, laboratory gloves, face mask, closed toe shoes.	Chemical fume hood
Operation of autoclaves	Burns	Appropriate gloves, eye protection, closed toe shoes.	Care in opening the door to avoid burns from escaping steam.
Dry ice, liquid nitrogen	Burns, asphyxiation risk	Appropriate gloves, eye protection, closed toe shoes, and use in well-ventilated room.	Dispose of any unused dry ice or liquid nitrogen in ventilated fume hood.
Centrifuges	Aerosolized fluids, zoonotic disease	Lab coat, facemask, appropriate gloves when handling samples or cleaning centrifuge.	Ensure proper balancing of centrifuge and contents. Do not open until rotor has stopped. Use closed-top swinger rotors to spin biological materials.
Hot plate	Possible burns	Appropriate gloves, closed toe shoes.	Do not leave unattended for extended periods.
Use of bleach to disinfect	Possible burns, respiratory irritation	Lab coat, gloves, closed toe shoes, and eye protection.	Use of chemical fume hood recommended when preparing bleach.
Disposing of needles, glass slides	Cuts, zoonotic disease	Gloves, sharps container, closed toe shoes.	Follow sharps safety procedures in this guide.
TRIzol Reagent (or Tri reagent; phenol solution)	Contact burns, systemic poisoning	In lab: Gloves, lab coat, close toe-shoes, eye goggles In field: Gloves, close toed-shoes, appropriate field PPE (e.g. coveralls, N95 mask, goggles per the task being performed – See Biosafety Guide)	Aliquot TRIzol for sampling in the field in a ducted biosafety cabinet or fume hood; Perform RNA extraction of samples collected into TRIzol in a biosafety cabinet

Definitions

***Highly hazardous materials** are chemicals, toxics and reactives that have the potential to cause immediate and permanent harm at feasible exposure levels. Chemicals that are highly toxic, are known to cause cancer or birth defects, have very low "permissible exposure limits," are highly reactive, or that react vigorously with common materials (such as water or air) should all be considered "highly hazardous materials." Chemicals that are under pressure, that can build up pressure, that can auto-ignite at possible temperatures, that burn vigorously and energetically, or that when burning cannot be extinguished with conventional methods, should be considered highly hazardous.

For a complete and updated list of Highly Hazardous Materials, visit the following OSHA link:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9761&p_table=standards

****Personal Protective Equipment (PPE)** is specialized clothing or equipment worn by an employee for protection against infectious and other hazardous materials. The warranted components of PPE vary according to the tasks being performed by personnel. A basic PPE kit may include: gloves, gowns or other protective clothing (e.g., plastic apron), shoe and head covers, mask or respirator, and face or eye protection (e.g., goggles).

Review of Material Safety Data Sheets

PREDICT personnel must verify that a Material Safety Data Sheet (MSDS) for each product to be used during PREDICT activities is readily available, complete and updated (less than three years old).

Coordinators must ensure that personnel have read and understand the MSDS BEFORE using a chemical product.

Personnel must be familiar with the name of the chemical and understand the hazards, safe handling and storage, and specific emergency procedures BEFORE using a chemical product.

Copies of MSDSs for all chemicals used in the laboratory should be kept together in a binder and placed in an accessible location known to all laboratory personnel.

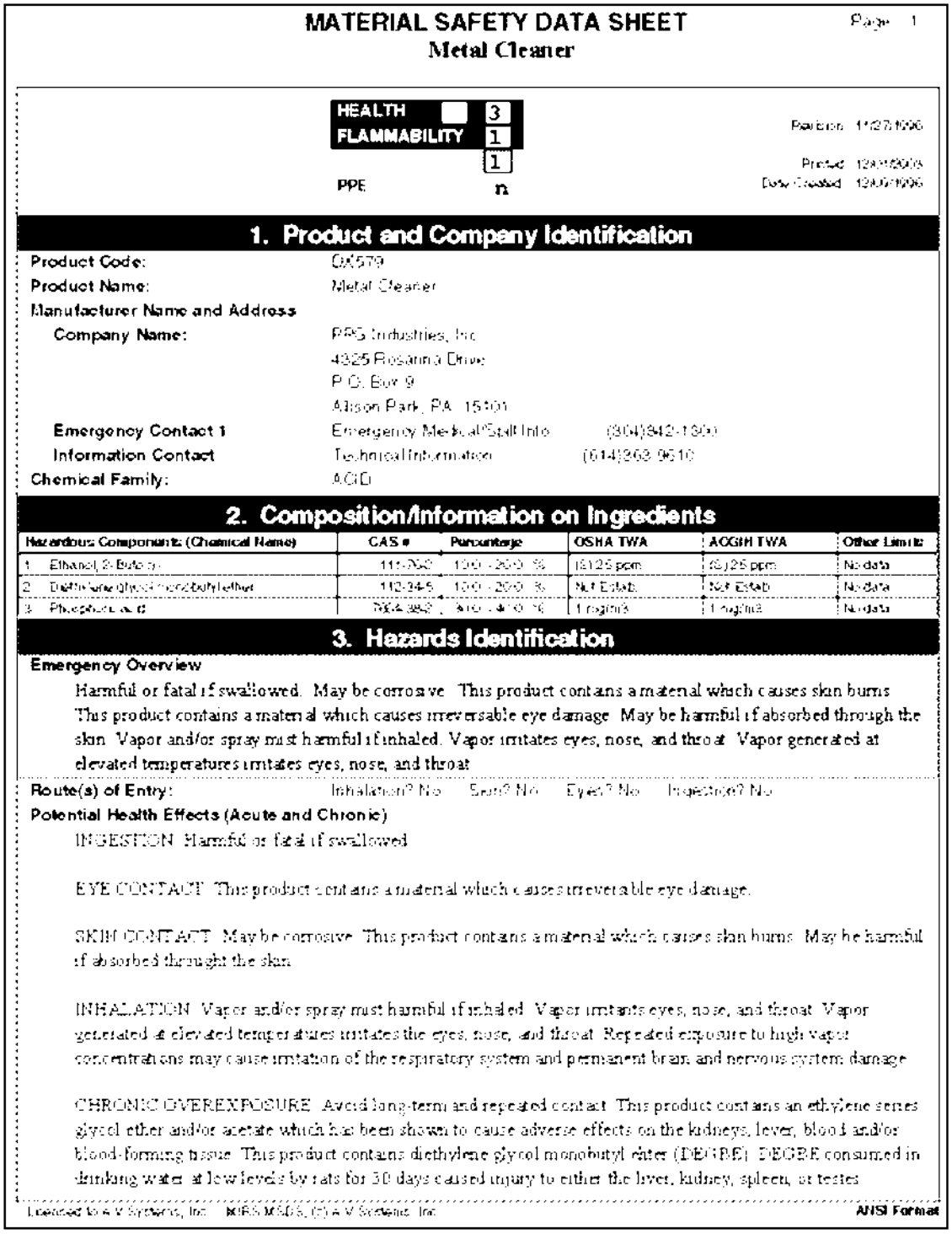
What is a Material Safety Data Sheet?

A MSDS is prepared by the supplier or manufacturer of the material and contains information on the potential hazards (health, fire, reactivity and environmental) and safe use of the chemical product. It is an essential information resource for all health and safety programs. The MSDS also contains information on the safe use, storage, handling and emergency procedures for all hazardous materials. The MSDS contains much more information about the material than found on the product label including what to do if accidents occur, and how to recognize and treat overexposure to the chemical product.

What information is on the MSDS?

The information of greatest concern to workers is featured at the beginning of the data sheet, including information on chemical composition and first aid measures. More technical information that addresses topics regarding the physical and chemical properties of the material and toxicological data appears later in the document. The 16-section MSDS is now recognized internationally. Each MSDS must include:

1. Identification (name, manufacturer and supplier names, address and emergency phone numbers)
2. Hazard(s) identification
3. Composition/information on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information



MATERIAL SAFETY DATA SHEET
Metal Cleaner

Page 1

HEALTH 3
FLAMMABILITY 1
1
PPE n

Revision 11/27/1996
Printed 12/31/2003
Date Created 12/27/1996

1. Product and Company Identification

Product Code: GC579
Product Name: Metal Cleaner
Manufacturer Name and Address
Company Name: PPS Industries, Inc.
4325 Rosanna Drive
P.O. Box 9
Allison Park, PA 15101
Emergency Contact 1 Emergency Medical Staff Info (304)842-1300
Information Contact Technical Information (614)268-9510
Chemical Family: ACID

2. Composition/Information on Ingredients

Hazardous Components (Chemical Name)	CAS #	Percentage	OSHA TWA	ACGIH TWA	Other Limits
1. Ethanol, 2-Butoxy-	111-762	10.0 - 20.0 %	(8) 25 ppm	(8) 25 ppm	No data
2. Diethylene glycol monobutyl ether	112-34-5	10.0 - 20.0 %	Not Estab.	Not Estab.	No data
3. Phosphoric acid	7664-38-2	10.0 - 20.0 %	1 mg/m3	1 mg/m3	No data

3. Hazards Identification

Emergency Overview

Harmful or fatal if swallowed. May be corrosive. This product contains a material which causes skin burns. This product contains a material which causes irreversable eye damage. May be harmful if absorbed through the skin. Vapor and/or spray must harmful if inhaled. Vapor irritates eyes, nose, and throat. Vapor generated at elevated temperatures irritates eyes, nose, and throat.

Route(s) of Entry: Inhalation? No Skin? No Eyes? No Ingestion? No

Potential Health Effects (Acute and Chronic)

INGESTION: Harmful or fatal if swallowed.

EYE CONTACT: This product contains a material which causes irreversible eye damage.

SKIN CONTACT: May be corrosive. This product contains a material which causes skin burns. May be harmful if absorbed through the skin.

INHALATION: Vapor and/or spray must harmful if inhaled. Vapor irritants eyes, nose, and throat. Vapor generated at elevated temperatures irritates the eyes, nose, and throat. Repeated exposure to high vapor concentrations may cause irritation of the respiratory system and permanent brain and nervous system damage.

CHRONIC OVEREXPOSURE: Avoid long-term and repeated contact. This product contains an ethylene series glycol ether and/or acetate which has been shown to cause adverse effects on the kidneys, liver, blood and/or blood-forming tissue. This product contains diethylene glycol monobutyl ether (DEGBE). DEGBE consumed in drinking water at low levels by rats for 30 days caused injury to either the liver, kidney, spleen, or testes.

Licensed to A V Systems, Inc. MSDS MSDS, (c) A V Systems, Inc. ANSI Format

Different jurisdictions have different content requirements for Material Safety Data Sheets. Despite the internationally recognized standard, a MSDS prepared in accordance with the United States OSHA Hazard Communication Standard is not necessarily acceptable in other countries. Check with local health authorities to ensure that your MSDSs are in compliance with local regulations.

Where to obtain MSDSs for chemical products?

A MSDS can be requested from the manufacturer or supplier of the product; in addition several MSDS databases exist online including:

SIRI MSDS index: **http://siri.org/msds/index.php**
MSDS online: **http://www.msdsonline.com** or **http://www.msdsonfile.com/mctx/msds/msdsonfile.jsp**
MSDS Hazard Communication Library: **http://www.setonresourcecenter.com/MSDSs/comply1.htm**

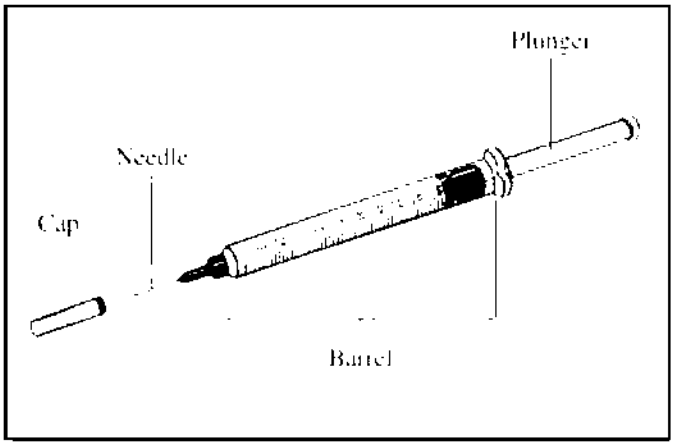
Needlestick Injury Prevention

Needlestick injuries are of concern in basic laboratory settings because they can result in the inoculation of personnel with infected materials. Additionally, skin breaks from needlesticks can act as portal of entry for environmental pathogens.

Most needlestick injuries occur during the following activities

- Recapping, bending, or breaking needles.
- Inserting a needle into a test tube or specimen container and missing the target.
- Carrying unprotected sharps.
- Leaving sharps in unexpected places, such as clothing.
- Handling or disposing of waste that contains used sharps.

Parts of a Syringe and Needle



Procedures to Prevent Needlestick Injuries

- Follow proper techniques when using needles and syringes.
- Be familiar with the different types and components of syringes and needles.
- When **uncapping a syringe needle**, pull the cap straight off to remove it and expose the needle.
- **Never leave an uncapped needle lying around.** A used syringe with the attached needle should be placed in a sharp disposal container immediately after use (a sharps disposal

container is designed for safe containment of medical articles that may cause punctures or cuts to those handling them – see below).

- **Removal of the syringe needle** may be necessary for transfer of the sample to another container, or for disposal of only the needle in the sharp container. When removal of the needle is necessary:
- Make sure not to remove the cap--twist the entire needle to take it off the syringe along with the cap. Alternatively, the needle may be removed from the syringe by use of forceps.
- Uncapped needles should never be removed from the syringe by hand.
- **Syringes and needles** used on humans should never be recapped. However, when working with animals and in the field, it may be necessary to carefully recap a needle to avoid accidental sticks if a sharps container is not immediately available.

If you recap a needle, use the *ONE HAND METHOD*

1. Lay the cap on a table or on a flat surface.
2. Hold the syringe by the end.
3. Tilt the end of the syringe up, so that the needle inside the cap is point down onto the surface.
4. Insert the needle on the syringe into the cap.
5. "Fish" up the cap with the needle.
6. Use the same hand to recap the needle.
7. Apply enough pressure to set the cap onto the needle.

If a needlestick occurs, it must be reported to your local PREDICT Supervisor and a medical professional immediately.

Section 6.3.4. Biohazards of Zoonotic Pathogens

Investigators working with domestic and wild animals and humans or with animal and human samples are at risk of disease due to exposure to zoonotic pathogens (pathogens transmitted between animals to humans). The zoonotic disease risk varies depending on the animal species being handled, but is generally caused by direct contact (e.g., contaminated/dirty hands), through open cuts, contact with blood and other body fluids, or inhalation of contaminated materials.

When performing tasks with risk of exposure to zoonotic pathogens (such as handling live or dead animals or samples from humans, collecting, testing, or packaging samples), PREDICT personnel should always wear the appropriate PPE as warranted by the assessed risk. It is the responsibility of the supervising veterinarian or medical specialist to determine the required PPE components for specific activities, based on an established PREDICT protocol or based on a risk assessment. (*See **Section 4. Biosafety and PPE Use** for more information about determining the appropriate PPE.)*

In the event that any personnel believe they have been exposed to material from a person or animal, they should immediately report the exposure to their supervisor, and if warranted seek the appropriate medical attention and follow-up.

Species-Specific Biosafety Precautions

The PREDICT Program will conduct surveillance and sampling among several groups of species. This section discusses special biosafety considerations for some of the key groups of species (bats, rodents, and non-human primates) likely to be handled as part of PREDICT activities.

Rodents, bats, non-human primates and other wild species may harbor pathogens that are transmittable to, and highly pathogenic in, humans. When handling these rodents, bats or non-human primates, careful consideration needs to be given to conscientious use of PPE, good personal hygiene (i.e., hand washing), safety training, and application of good animal handling and sampling techniques to minimize exposure to infection or injury.

In the event of an injury while handling animals that pose risk of zoonotic pathogen exposure, appropriate first aid must be applied. The risk of infection can be significantly reduced with immediate and thorough scrubbing of the wound with soap or antiseptic.

Vaccination to prevent rabies infection: Personnel who are handling animals that are known reservoirs for rabies (e.g., bats and dogs) should be immunized against rabies virus according to World Health Organization and CDC recommendations.

Investigators should familiarize themselves with known biohazards specific to species under study and with the procedures for the isolation and control of zoonotic pathogens.
Specific considerations with regard to working with rodents, bats and non-human primates are discussed below:

Rodents

Wild rodents have the potential to carry a variety of zoonotic bacteria and viruses that can be passed on to those handling them. Because of the serious consequences of becoming infected, personnel must always follow good personal hygiene and animal handling procedures and use the provided PPE to protect against exposure.

Special Precautions:

- Wear the minimum PPE for handling rodents as specified in the PREDICT PPE Use Guide, this includes an N95 mask, eye-protection, gloves and coveralls, or clean dedicated clothing.
- Personnel who are handling animals should be immunized against rabies virus according to the World Health Organization and CDC recommendations.

Bats

Exposure to wild bat roosts (in caves or trees), handling of bats in the field or handling bat excreta (urine or feces) presents a potential for exposure to zoonotic pathogens. Rabies, Nipah virus, Ebola virus, and the fungal disease histoplasmosis are examples of zoonotic pathogens carried by some bat species. Bat bites, scratches and wound and mucous membrane exposure to bat saliva are the ways in which rabies can be transmitted. Spores of histoplasmosis can be present in soil and debris enriched with bird and bat droppings. When this dry soil is disturbed, spores can become airborne and cause infection by inhalation.

Special Precautions:

- When working around bats in enclosed spaces, such as in a cave, wear at a minimum an N95 respirator, goggles, gloves and Tyvek coveralls (or dedicated long-sleeved clothing).
- Personnel who are handling animals such as bats should be immunized against rabies virus and be aware of appropriate post exposure prophylaxis in the case of bites according to World Health Organization and CDC recommendations.

Non-Human Primates

Non-human primates may be infected with a number of potentially serious zoonoses. For example, all macaque monkeys and their fluids should be considered to be infected with **Herpes Simian B virus**. Marmosets, although they do not carry the herpes B virus, can carry other disease agents that affect humans such as lymphocytic choriomeningitis virus and *Trypanosoma cruzii*, the cause of Chagas' disease. It is critical that work with non-human primates be done while wearing the appropriate personal protective equipment and with the well-established safe protocols and procedures.

Special Precautions:

- Personnel must follow strict hygiene procedures. Frequent and thorough hand washing, although too often overlooked by the staff, is critical to physically remove bacterial contamination and prevent ingestion exposure.
- PREDICT personnel must wear the minimum PPE for handling non-human primates as specified in the PREDICT PPE Use Guide. This includes an N95 mask, eye-protection, gloves and coveralls or clean dedicated clothing.

Biosafety Levels and Practices

General

All laboratories handling biological agents must post signage indicating that the site is a potential biological hazard area, and identifying all agents in use. Supervisors shall ensure that employees are informed of biological hazards and that suitable biosafety controls are in place. Country Coordinators and lab and field supervisors managing surveillance and other field and laboratory activities should ensure that appropriate biosafety practices are implemented by personnel. Biological safety cabinets are to be certified annually.

It is important to know the biosafety level of the disease that you are working with before beginning work, so that the correct precautions can be taken.

Note: All samples collected for the PREDICT project are to be handled in a Class II Biosafety Laboratory.

Basics of Biosafety Level 1

Biosafety Level 1 (BSL1) practices represent a basic level of containment that relies on standard microbiological practices and basic safety equipment and lab design for laboratories that work with defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy adult humans. However, many agents not ordinarily associated with disease processes in humans are opportunistic pathogens and may cause infection in the young, the aged, and immuno-deficient or immunosuppressed individuals.

BSL-1 Standard Microbiological Practices

1. Access to work areas is limited at the discretion of the supervisor.
2. Hands must be washed after handling biological materials, removing gloves, or before leaving the laboratory.
3. No eating or drinking is allowed in the laboratory.
4. Only mechanical devices are used for pipetting.
5. Safety devices such as self-protected injection syringe or non-sharps should be used as an alternative to sharps. Sharps used should be handled and disposed of properly.
6. Activities that are likely to create splashes, sprays, or aerosols should be minimized.
7. Work surfaces should be decontaminated with 10% bleach (70% ethanol for metal surfaces) at least daily (before and after work with infectious samples) and after any spills.
8. Waste materials should be disposed of properly.
9. Secondary containment should be used when transporting bio-hazardous materials outside of the laboratory. Avoid public areas during transport.

BSL-1 Safety Equipment (Primary Barriers)

1. BUTTONED lab coats should be worn to protect street clothes.
2. Barrier (preferably non-latex) gloves should be worn, particularly if hands have broken skin or a rash.
3. Appropriate eye/face protection (safety goggles as a minimum) should be worn if splashes or sprays are anticipated, or if wearing contact lenses during lab work.

BSL-1 Laboratory Facilities (Secondary Barriers)

1. The lab should have a sink for hand washing.
2. The lab should have an eye wash station.
3. The lab should have a door for access control.
4. The lab fixtures and floors should be easily cleaned and disinfected (no carpets or rugs); bench tops are to be impervious to water and resistant to both moderate heat and the chemicals used to decontaminate the work surface and equipment.

Note: BSL-1 is NOT APROPRIATE for PREDICT samples.

Basics of Biosafety Level 2

Biosafety Level 2 is more restrictive than BSL-1 and is suitable for work involving agents of moderate potential hazard to personnel and the environment. All PREDICT samples are to be handled in a Biosafety level 2 laboratory. It differs in that (a) laboratory personnel have specific training in handling pathogenic agents and are directed by trained technologists, (b) access to the laboratory is limited when work is being conducted, (c) extreme precautions are taken with contaminated sharp items, and (d) certain procedures in which infectious aerosols or splashes may be created are conducted in biological safety cabinets or other physical containment equipment. **All PREDICT samples are to be handled in Class II biological safety cabinets, in Biosafety level 2 laboratory.**

BSL-2 Standard Microbiological Practices

1. Personnel must wash their hands after they handle viable materials, after removing gloves, and before leaving the laboratory.
2. Eating, chewing gum, drinking, smoking, handling contact lenses, and applying cosmetics should not be permitted in the laboratory. Persons who wear contact lenses in laboratories should also wear goggles or a face shield. Food should be stored outside the work area in cabinets or refrigerators designated for this purpose only.
3. Only mechanical pipetting devices are used for pipetting.
4. Policies for safe handling of sharps (when non-sharps are not available) should be instituted.
5. All procedures should be performed carefully to minimize the creation of splashes or aerosols.
6. Work surfaces should be decontaminated with 10% bleach (70% ethanol for metal surfaces) at least once a day (before and after working with infectious samples) and after any spill of viable material.

7. All cultures, stocks, and other regulated wastes are disposed of in the biohazard trash by placing them in a durable, leak-proof container, closed for transport from the laboratory, and transferred to the designated receptacle for disposal. Materials to be decontaminated at off-site locations from the laboratory should be packaged in accordance with applicable local, state, and federal regulations, before removal from the facility.

BSL-2 Special Practices

1. Access to the laboratory is limited or restricted by the laboratory supervisor when work with infectious agents is in progress. In general, persons who are at increased risk of acquiring infection, or for whom infection may be unusually hazardous are not allowed in the laboratory. Persons who are immuno-compromised, immunosuppressed, pregnant or at higher risk of acquiring infections, should not be permitted in the laboratory.
2. The laboratory director establishes policies and procedures whereby only persons who have been advised of the potential hazard and meet specific entry requirements (e.g., immunization) enter the laboratory.
3. Laboratory personnel receive appropriate immunizations or tests for the agents handled or potentially present in the laboratory (e.g., hepatitis B vaccine or TB skin testing).
4. A high degree of precaution must always be taken with any contaminated sharp items, including needles and syringes, slides, pipettes, capillary tubes, and scalpels.
    - Only needle-locking syringes or disposable syringe-needle units (i.e., needle is integral to the syringe) are used for injection or aspiration of infectious materials. Used disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal; rather, they must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal. Non-disposable sharps must be placed in a hard-walled container for transport to a disposal area.
    - Broken glassware must not be handled directly by hand, but must be removed by mechanical means such as a brush and dustpan, tongs, or forceps. Containers of contaminated needles, sharp equipment, and broken glass should be decontaminated with 10% bleach before disposal, according to any local, state, or federal regulations.
5. Cultures, tissues, or specimens of body fluids are placed in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping.
6. Laboratory equipment and work surfaces should be decontaminated with an appropriate disinfectant (such as 10% bleach) on a routine basis, before and after work with infectious materials is finished, and especially after overt spills, splashes, or other contamination by infectious materials. Contaminated equipment must be decontaminated according to any local, state, or federal regulations before it is sent for repair or maintenance or packaged for transport in accordance with applicable local, state, or federal regulations, before removal from the facility. Bleach (10%) can be used on all non-steel surfaces; however, 70% ethanol or other recommended disinfectant should be used when those chemicals are not available.

7. Spills and accidents that result in overt exposures to infectious materials should be reported immediately to the laboratory director. Medical evaluation, surveillance, and treatment should be provided as appropriate and written records should be maintained.

BSL-2 Safety Equipment (Primary Barriers)

1. **Properly maintained biological safety cabinets, Class II,** and other appropriate personal protective equipment or physical containment devices **should be used**.

Procedures with a potential for creating infectious aerosols or splashes are a hazard. These may include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, opening containers of infectious materials whose internal pressures may be different from ambient pressures, inoculating animals, and harvesting infected tissues from animals, eggs or cell cultures.

2. Face protection (goggles, mask, face-shield or other splatter guards) should be used for anticipated splashes or sprays of infectious or other hazardous materials to the face, when the microorganisms must be manipulated outside of the biosafety cabinet.
3. Protective laboratory coats, gowns, smocks, or uniforms designated for lab use should be worn while in the laboratory. This protective clothing should be removed and left in the laboratory before leaving for non-laboratory areas (e.g., cafeteria, library, administrative offices). All protective clothing should be disposed of either in the laboratory or laundered by the institution; it should never be taken home by personnel.
4. Gloves (nitrile or latex) should be worn when hands may contact infectious materials, contaminated surfaces or equipment. Wearing two pairs of gloves may be appropriate, if a spill or splatter occurs; the hand will be protected after the contaminated glove is removed. Gloves should be removed and disposed of when contaminated, removed when work with infectious materials is completed, and should not be worn outside the laboratory. Disposable gloves are not washed or reused.

BSL-2 Laboratory Facilities (Secondary Barriers)

1. Each laboratory should contain a sink for hand washing.
2. The laboratory is designed so that it can be easily cleaned and disinfected. Rugs in laboratories are not appropriate, and should not be used because proper decontamination following a spill is extremely difficult to achieve.
3. Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.
4. Laboratory furniture is sturdy, and spaces between benches, cabinets, and equipment are accessible for cleaning.
5. An eyewash facility is readily available.
6. The laboratory should be at negative pressure with respect to areas outside the lab. Hoods and biosafety cabinets should be positioned away from doors, supply vents and air conditioner airflow.

Biosafety Level 3

Biosafety Level 3 is applicable to working with indigenous or exotic agents, such as brucella and tuberculosis, that may cause serious or potentially lethal disease through the inhalation route of exposure. Laboratory personnel must receive specific training in handling pathogenic and potentially lethal agents, and must be supervised by scientists competent in handling infectious agents and associated procedures. All procedures involving the manipulation of infectious materials must be conducted within a BSC (preferably Class II or Class III), or other physical containment devices. A BSL-3 laboratory has special engineering and design features.

Biosafety Level 4

Biosafety Level 4 is required for work with dangerous and exotic agents, such as Ebola, that pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening disease that is frequently fatal, for which there are no vaccines or treatments, or a related agent with unknown risk of transmission. Agents with a close or identical antigenic relationship to agents requiring BSL-4 containment must be handled at this level until sufficient data are obtained either to confirm continued work at this level, or re-designate the level. Laboratory staff must have specific and thorough training in handling extremely hazardous infectious agents. Laboratory staff must understand the primary and secondary containment functions of standard and special practices, containment equipment, and laboratory design characteristics. All laboratory staff and supervisors must be competent in handling agents and procedures requiring BSL-4 containment. The laboratory supervisor in accordance with institutional policies controls access to the laboratory.

Section 6.3.5. Medical Monitoring

The major purpose of medical monitoring is the early detection of disease or conditions for which treatment can prevent further illness. Medical monitoring is conducted to evaluate exposure to human and zoonotic diseases and unanticipated adverse health effects of exposure. It can also be a valuable tool for hazard control to monitor if initially effective control or work practice has lost effectiveness, or by detecting previously unknown exposures.

Medical consultations should take place:

- Whenever an injury occurs, such as a needlestick, or splash with contaminated material.
- Whenever an employee develops symptoms of exposure to a hazardous chemical or biological agent to which the employee may have been exposed in the laboratory.
- Whenever a spill, leak, explosion, or other occurrence results in the likelihood of an overexposure to a hazardous chemical or biological agent.
- When an employee requests a medical consultation due to health concerns related to assigned tasks and/or change in personal medical history, such as pregnancy, special medications, diagnosed hypersensitivities or other illnesses.
- When exposure monitoring results trigger medical surveillance requirements or when other regulations mandate medical consultations, such as for the use of respiratory protection.

Section 6.3.6. Medical Waste Management

Safe Sharps Disposal

The term "sharps" refers to any object that can cut or puncture the skin including, but not limited to, needles (hypodermic and suture), scalpels, lancets, broken vials or glass, broken capillary tubes, slides and coverslips, and exposed ends of contaminated wires. The primary cause of occupational exposure to blood-borne pathogens in field and laboratory personnel is injury from needlesticks or other sharp objects. At least 20 pathogens are known to have been transmitted following percutaneous exposure to blood. Infections with each of these pathogens are potentially life threatening – and preventable.

How to prevent sharp injuries:

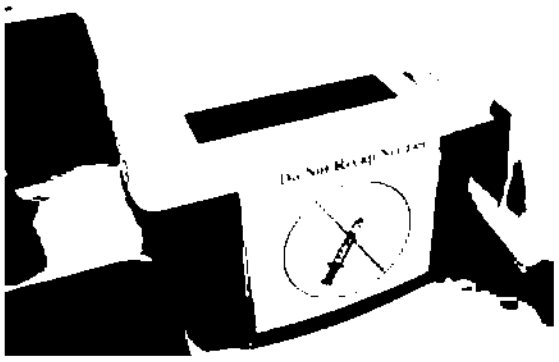
- Do not bend, break, or cut sharps. Shearing or breaking of needles is prohibited.
- Concentrate on what you are doing and do not get distracted.
- Dispose of all sharps in an approved puncture-resistant container as soon after use as possible.
- Ensure this container is placed in the area where sharps are used.
- Ideally, needle and syringe should be disposed as one unit if possible. If a needle must be removed follow the directions on the **Removal of the syringe needle** section above.
- Do not recap needles unless absolutely necessary. If recapped, never use two hands, instead use the one-hand "scoop" technique (see **Removal of the syringe needle** section above).
- Do not overfill sharps disposal container. Seal the container and replace when it is ¾ full.
- Do not empty sharps containers. Dispose of whole container as one unit.
- Wear utility gloves when disposing of medical waste including sharps containers.
- To prevent sharp injuries during transport of medical waste, use a puncture-proof container that remain closed.

Sharps Disposal Containers

Never discard needles and sharps in waste bags, as personnel might be injured when they handle the bags.

Sharp containers are available commercially or can be adapted from some containers that comply with minimal safety standards.

Commercial sharp disposal container boxes)



Non-commercial sharp disposal containers (safety

There are four major criteria for sharps disposal container safety performance, functionality, accessibility, visibility, and accommodation:

Functionality: Containers should remain in a good state during their entire usage. They should be leak-resistant on their sides and bottoms and puncture-resistant until final disposal. Individual containers should have adequate volume and safe access to the opening.

Accessibility: Containers should be accessible to all workers who use, maintain, or dispose of sharp devices. Containers should be placed in all areas where sharps are used and, if necessary, be portable within the workplace or for fieldwork. Portable containers must have a lid to prevent spills and injuries during transport or while working in the field.

Visibility: Containers should be plainly visible to the workers who use them. Workers should be able to see the warning labels and the degree to which the container is full.

Accommodation: Container designs should be convenient, environmentally sound, and easy to store.

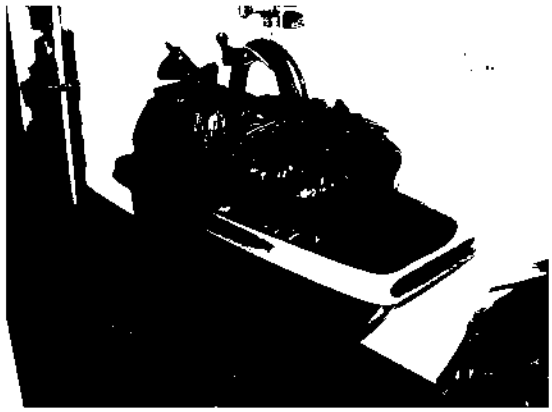
Medical Waste Disposal

Biological waste includes human and animal tissues, fluids and animal carcasses. These are generated along with the sharps and other biologically contaminated equipment that typically need to be discarded in all laboratories (e.g. pipette tips, gloves).

Animal carcasses should be bagged, sealed, and stored in freezers located in the facility until pick up for incineration.

All other biologically contaminated material should be placed in a red bag-lined medical waste box. When the medical waste box is full, it is the responsibility of the field and laboratory personnel to seal the bag, seal the box, and apply a label that contains information about the generating lab.

Medical waste container appropriate for storing and transporting biological waste



Inappropriate container and method for storing and transporting biological waste

Section 6.3.7. Special Chemical Storage and Handling Practices

Laboratory chemical storage and handling hazards can be effectively managed if you:

- Maintain good inventory control and purchase/use the least amount possible.
- Label all stored and in-process chemicals clearly and completely.
- Adopt safe handling practices.
- Use secondary containment and practice your spill response plan.
- Segregate incompatible chemicals and store them in separate appropriate cabinets or cold-storage.
- Develop special controls for highly hazardous materials.

Inventory Control

- Purchase chemicals only in the quantities needed and in containers of the smallest practical size. Although the cost may be higher, significant savings will be gained by reduced hazardous waste disposal or clean-up costs.

- Inventory your chemical supplies at least annually and actively share or distribute excess stocks with other departments to minimize waste. Dispose of all unused and outdated chemicals through appropriate hazardous waste programs.
- Products that could also be purchased for home use, such as soap, oil, or cleaning sprays, should be part of your chemical inventory and have an MSDS on file if the product will be used in an occupational setting and could cause a health exposure in the workplace.
- Before laboratory personnel leave the laboratory, all leftover chemicals should be inventoried and distributed or disposed of.

Labeling

Personnel should ensure that labels on containers of hazardous chemicals are not removed or altered, particularly the manufacturer's original label. Empty chemical containers must never be reused for another purpose, even if the labeling is changed as reactions with new liquid and residual chemical could be extremely dangerous. All bottles, containers, and other apparatus containing chemicals should be accurately and clearly labeled as to contents, hazards, and where practical, the appropriate precautions required when handling the chemical.

Avoid the use of grease pencils or other markers that will wear off.

There are three levels of complexity to labeling: original container, secondary transfer containers, and small container (vials, flask, beakers) for immediate, same-day use.

1. The manufacturer's original labels must contain the following information:
    - Name of chemical or solution
    - Manufacturer name and emergency telephone number
    - Hazard warning (health effect or target organs)

    When opening you must add:
    - Date received and opened
    - Initials

2. For laboratory-prepared solutions and when chemicals are transferred to secondary containers not intended for immediate use, labels should include:
    - Name (no abbreviations) of the chemical and its concentration.
    - For prepared solutions or any secondary containers: initial and date prepared.
    - Hazard warning on the most serious health or safety hazard posed (consult MSDS). Stickers can be applied indicating "corrosive," "carcinogen," "water-reactive," "flammable," etc.
    - If special precautions are critical, expand the hazard warning to include the target organ and the required protection (e.g., "Corrosive, esp. to skin and eyes. Use gloves and goggles").

3. Containers for immediate (same-day) use should have:
    - Chemical name and its concentration
    - Date
    - Initials

Safe Handling and Transfer

Hand-carried chemicals should be placed in unbreakable secondary containers such as bottle carriers or acid-carrying buckets. Wheeled carts used to transport chemicals should have side guards and lipped surfaces capable of containing a break, and sturdy wheels that move easily over uneven surfaces.

Staff should wear protective aprons, gloves, goggles and closed-toed shoes when transporting chemicals.

Class I flammable liquids (any liquid having a flash point below 37.7°C should not be stored or transferred from one vessel to another in an exit access corridor, open plan building, or in an ancillary space unprotected from the exit access corridor.

Transfer of Class I liquids to smaller containers from bulk stock containers not exceeding 5 gallons in capacity should be performed in a laboratory hood, in an area provided with ventilation adequate to prevent accumulations of flammable vapor exceeding 25% of the lower flammable limit, or within an inside liquid storage area approved for dispensing.

Class I liquids should not be transferred between conductive containers of greater than 1.1 gallons, unless the containers are bonded and grounded (the process of providing an electrically conductive pathway - usually by clipping connecting wires - between a dispensing container and a receiving container [bonding], and the receiving container and an earth ground).

Secondary Containment and Spill Control

Liquid chemicals should be stored in corrosion-resistant trays or on spill pallets or other secondary containment to contain a break or leak.

Concentrated acids and bases should be stored in acid or caustic storage cabinets. If possible, keep corrosives stored in their original (e.g. Styrofoam cubes) shipment containers.

In the event of a chemical spill, try to turn off all reaction apparatus, especially heat sources, notify supervision immediately and follow the response steps in your facility.

Cabinet and Shelf Storage – General Precautions

Cabinets and other storage areas should be marked with the general class of chemical stored, and any other pertinent warnings.

Storage areas should have good general ventilation and be well lighted.

On shelves, containers should be staggered for easy access, with labels facing out. DO NOT ALPHABETIZE STORED CHEMICALS; SEPARATE BY COMPATIBILITY (see next section).

Heavy and large containers are to be placed on bottom shelves. Chemicals, especially liquids, should be stored below eye level. Larger containers should be stored on lower shelves. Exposure to heat or direct sunlight should be avoided. Avoid storing chemicals on the floor unless in approved shipping containers. Minimize open shelf or bench top storage, except for those chemicals currently being used, to prevent accidental spills and reduce the risk of fires.

Cabinets specifically for corrosives (either acids or bases) should have corrosion-resistant paint. Flammable storage cabinets should provide an airtight seal; vent holes should be kept covered and flame-arrestor kept in place.

Oxidizers MUST be stored in separate cabinets from flammables and combustibles. Oxidizers, explosives, and organic peroxides must be separated from combustibles and placed in a metal cabinet, or in an approved dry, cool, and well-ventilated location.

If acids and bases must be stored together in the same cabinet, place each in separate secondary containers (non-reactive trays) on opposite sides of the cabinet to minimize intermingling in case of a spill or drip (in other words, do not store all the acids on one shelf, and all the bases on the shelf below).

Initially assign each chemical to broad hazard classes, for example: flammable, corrosive (acids and bases), reactive oxidizer or reducer, special hazard (air/water reactive, peroxide forming chemical, store at reduced temperature or under an inert atmosphere, highly toxic).

Chemicals that possess more than one hazard (i.e., oxidizer and corrosive) are assigned to the class that represents the greater hazard for that laboratory.

Post incompatibility lists (from your MSDSs) for reference.

Hazardous chemicals should be disposed of in clearly labeled containers, and as with storage, separated by class. For example, acids should not be disposed of with bases but should be separated. The same is true for corrosives and flammables.

Refrigerators and Freezers – Flammable Storage

All refrigerators or freezers should be distinctly marked as to whether they are suitable for the storage of flammable liquids.

Standard household-variety refrigerators should not be used to store flammable liquids.

Flammable liquids stored in refrigerated equipment should be in closed containers.

Storage of Chemicals by Class

Flammables and Combustibles

Flammables are chemicals that have a flash point less than 37°C (100°F). Combustible chemicals have flash points that are 37-93°C. If stored or used improperly, flammables and combustibles can be a fire hazard.

Examples of flammable liquids include benzene, alcohols, acetone, ethers, organic acids (i.e., glacial acetic acid).

The quantity of flammable/combustible hazardous chemicals within a laboratory unit or in a laboratory work area, that is stored in the open, shall be limited to the minimum necessary to perform required tasks.

Bulk supplies of alcohol (such as 95% EtOH in drums) should be stored in an approved flammable liquids storage room.

To the greatest degree possible, the storage of flammable liquids in a laboratory work area, outside of an approved flammable liquids cabinet, or storage room should be limited to what is needed for a single day's use. Otherwise, flammable liquids should be stored within an approved flammable liquids cabinet when not in use.

Corrosives: Acids

Acids are corrosive and react violently with bases. There are two main groups of acids: organic acids, and inorganic (mineral) acids. Some inorganic (mineral) acids are oxidizers and will react with organics, increase burning rate of combustibles and contribute an oxygen source to a combustion reaction. Therefore, inorganic (mineral) acids should be stored separately from organic acids.

Examples of inorganic OXIDIZING acids: perchloric acid (particularly dangerous at elevated temperature), chromic acid, nitric acid, sulfuric acid (particularly dangerous at elevated temperature).

Examples of inorganic MINERAL acids: hydrochloric acid, hydrofluoric acid, phosphoric acid.

Examples of organic acids: acetic acid, formic acid, butyric acid, propionic acid, picric acid, acrylic acid.

Oxidizing inorganic acids should be segregated from organic acids, flammable and combustible materials. Most mineral acids can be stored together, except perchloric acid (see below):

Nitric acid shall be stored separate from other acids.

Segregate acids from bases and active metals such as potassium and magnesium.

Segregate acids from chemicals that could generate toxic gases upon contact, such as sodium cyanide.

Segregate acids from solvents such as toluene and xylene.

Organic acids (e.g., glacial acetic acid) are combustible and should be stored separately or with flammables rather than with inorganic acids. Several inorganic acids are oxidizers and are therefore incompatible with organics.

Corrosives: Bases
Bases are corrosive and react violently with acids.

Examples: ammonium hydroxide, sodium hydroxide, calcium hydroxide, organic amines.

Segregate bases from acids. Bases are also corrosive to skin and tissue. Pay meticulous attention to PPE when using bases.

Reactive: Oxidizers
Oxidizers react vigorously with reducing materials. The reaction can lead to fires or explosions. Oxidizers will increase the burning rate of combustible materials and contribute oxygen to a combustion reaction.

Examples: halogens, ammonium persulfate, hydrogen peroxide, sodium dichromate, potassium permanganate, perchloric acid; at elevated temperature, ammonium nitrate (and other nitrate salts).

Keep oxidizers away from flammables, combustibles (such as paper, wood) and other reducing agents.

Reactive: Reducers
Reducing materials react vigorously with oxidizers. The reaction can lead to fires or explosions.

Examples: ammonia, carbon, metals, metal hydrides, phosphorus, silicon, sulfur.

Store reducing materials away from oxidizers.

Water-reactive Chemicals
Water reactive materials react with water, water solutions, moisture, or humidity in the air to produce heat and/or flammable gases, which can ignite.

Examples: sodium (elemental), potassium (elemental), calcium carbide, phosphorous pentachloride.

Store water reactives away from any sources of water or moisture. Review manufacturer's recommendations for special storage conditions, such as under an inert atmosphere or, as in the case of elemental sodium, under mineral oil.

Peroxide Forming Chemicals

Potentially explosive peroxides are formed by a free-radical reaction of hydrocarbons with molecular oxygen. Distillation, evaporation or other concentration of the peroxide can cause an explosion in contaminated hydrocarbons.

Examples: diethyl ether, tetrahydrofuran, acetaldehyde, isopropyl ether.

Store peroxide-forming chemicals away from light and heat. Carefully label all containers with the date received and the date opened. Monitor container dates and avoid keeping peroxide-forming chemicals on hand for more than a year after receipt and 6 months after opening.

Highly Hazardous Chemicals

Highly hazardous chemicals are defined as chemical carcinogens, reproductive toxins, acutely toxic substances, and highly reactive materials (ex. Ethidium bromide used in molecular laboratories).

Designate a Restricted Work Area. Conduct all transfers and work with these substances in a "controlled area" (i.e., a restricted access hood, glove box, or portion of a lab designated for use of highly-toxic substances) for which all personnel with access are aware of the substances being used and the necessary precautions that must be taken. Only trained and authorized personnel should work in or have access to controlled areas.

Signs and labels. Assure that the controlled area is conspicuously marked with restricted access and warning signs, such as, "WARNING: Highly-Toxic Substance in Use: Authorized Personnel Only" or "WARNING: Cancer-Suspect Agent: Authorized Personnel Only." All containers of these substances must be appropriately labeled with identity and warning such as, "Warning: High Chronic Toxicity or Cancer Suspect Agent."

Storage. Store containers of these chemicals in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.

Establish Decontamination Procedures. The need for routine decontamination of designated work area, equipment, or personnel depends on the laboratory circumstances.

Medical surveillance. When using a highly toxic substance on a regular basis (e.g., 3 times per week), consult with your supervisor concerning medical surveillance or other health concerns you may have.

Cleanup and Waste Disposal. Use chemical decontamination whenever possible. Use a vacuum cleaner equipped with a High Efficiency Particulate Air (HEPA) filter, instead of dry sweeping

when the toxic substance is a dry powder. A wet mop may also be used when the chemical is not water reactive or otherwise incompatible with water. Ensure that all vacuum filters, bag debris, mop heads or cleaning rags, as well as waste chemicals are transferred from the designated control according to a hazardous waste disposal container. Ensure that contingency plans, equipment, and materials are available to minimize exposures to personnel and property in the event of an accident. Do not ask/expect custodial staff to clean hazardous materials spills, unless they are already members of the facility's trained response team.

Hazardous Waste Disposal and Spill Control

Each container of hazardous waste is to be labeled with the following legends:

"HAZARDOUS WASTE"
Contents (be specific as to chemical):
Accumulation start date:

If a reagent container label has been removed or becomes illegible, and the identity of the contents is unknown, the container must be disposed of as soon as possible by arrangement with the facility hazardous waste coordinator.

Prior to the departure of staff, chemicals for which that person was responsible should be inventoried and discarded or returned to storage.

Pouring hazardous waste chemicals down the drain, adding them to regular trash, or evaporating them in a local exhaust hood could be illegal actions!

Section 6.3.8. Training in Basic Laboratory Procedures and Protocols

Training and education in laboratory safety need to be an ongoing process, not just an annual presentation. The most effective way to reinforce good work practices is to involve all personnel from principal researchers to volunteers in regular, periodic reviews and updates of this Basic Laboratory Safety Guide. Documentation of all forms of training is to be maintained in the laboratory as well as reported to the facility safety coordinator.

INITIAL BASIC LAB HAZARD AWARENESS TRAINING **is mandatory for all staff** and must be provided to all employees doing field and laboratory work prior to actual lab and field work, and prior to assignments involving new potential exposures. Information provided during trainings should include:

The location and availability of the Laboratory Safety Plan, chemical inventory, Material Safety Data Sheets (MSDSs), applicable regulatory exposure limits, and other reference material regarding the safe handling, storage, and disposal of hazardous chemicals (or hazardous collections) in the lab.

Signs and symptoms associated with exposures to hazardous chemicals and biological agents used in the laboratory, as well as the health hazards themselves.

Methods that may be used to detect the presence or release of a hazardous chemical. This could include industrial hygiene monitoring, the use of continuous monitoring devices, visual appearance, or odors of chemicals.

Methods employees can take to protect themselves from hazards, including work practices, personal protective equipment and emergency procedures listed in the LSP. This should include a discussion of the proper use and limitations of engineering controls and safety devices, including chemical and biological hoods.

Emergency response plans established by each facility's Emergency/Disaster Response Plan, any medical or first aid response specifically recommended, extinguishment of clothing fires (Stop, Drop, and Roll), and Chemical Spill Response Plans established by each facility.

Section 6.3.9. Basic Standards and Guide Checklists

- ☐ Coordinators should provide a "Useful Contacts" list with address and numbers of local medical and emergency response services.
- ☐ Personnel should know the locations of the emergency supplies (fire extinguishers, first aid kits, spill kits, safety showers and eye wash stations), phone numbers of supervisor and exits.
- ☐ Coordinators must verify that a Material Safety Data Sheet (MSDS) for each product to be used during PREDICT activities is readily available, complete and updated.
- ☐ Personnel should know where the MSDSs are located.
- ☐ Coordinators must ensure that personnel have read and understood the MSDS before using a chemical product
- ☐ Coordinators must have MSDS data available for emergency responders.
- ☐ Individuals that have been exposed to any hazardous chemical or biological agent should immediately report the exposure to medical authorities and supervisor.
- ☐ A complete list with the contents of the PPE kit should be available to the personnel.
- ☐ Personnel should wear appropriate PPE (lab-coat, protective glasses, gloves, closed toed shoes) for laboratory procedures.
- ☐ Inspect your PPE to ensure that it is in proper working condition before use (goggles, gloves, etc.).
- ☐ If you are working with PPE kits, ensure that the kit is stocked and material has not expired.
- ☐ Personnel must use a chemical, fume or laminar flow hood when indicated.
- ☐ All needles, scalpel blades and any other sharp instruments should be used and disposed of in a manner that prevents accidental human injury.
- ☐ All stored and in-process chemicals should be labeled clearly and completely.
- ☐ Segregate incompatible chemicals and store in appropriate cabinets or special cold-storage.
- ☐ Develop special controls for highly hazardous materials.
- ☐ Purchase chemicals only in the quantities needed and in containers of the smallest practical size.
- ☐ Inventory your chemical supplies at least annually and actively share or distribute excess stocks with other departments.
- ☐ Dispose of all unused and outdated chemicals through appropriate hazardous waste programs and NOT down the drain or by adding them to regular trash.
- ☐ Sinks and eye wash stations should be kept clear and in proper working condition.
- ☐ Staff should wash their hands and forearms after they have removed and disposed their PPE or after removing gloves.
- ☐ Food and beverages are NOT allowed in any of the labs.
- ☐ Report any lab failure (equipment, facilities, etc.) to the supervisor.
- ☐ Staff should keep BUTTONED lab coats at all times when working in the laboratory.
- ☐ All human and animal tissues, fluids and excrement should be handled in a Class II Biosafety Cabinet so that the potential for human exposure is minimized.
- ☐ Specific Biosafety levels 1 and 2 practices should be followed by personnel as warranted.
- ☐ Personnel must be familiar with hazard controls and safe operating procedures.

Section 6.3.10. List of Equipment and Supplies

- [ ] Lab-coat
- [ ] Nitrile gloves ideal, latex if not available
- [ ] Face-mask
- [ ] Goggles
- [ ] Face-shield
- [ ] Closed toed shoes
- [ ] Disposable (Tyvek) suit
- [ ] Sharp-container
- [ ] Medical waste box
- [ ] Respirator
- [ ] PPE Kits or Supplies
- [ ] Eyewash station
- [ ] Liquid nitrogen gloves

Section 6.3.11. References

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Section 4. Biosafety and Personal Protective Equipment (PPE) Use

Prepared by
Terra Kelly, UC Davis
Matthew LeBreton, Metabiota
and the PREDICT One Health Consortium.

Objective: To provide principles and general guidelines for the use of Personal Protective Equipment (PPE) to prevent exposure to and transmission of infectious pathogens during PREDICT activities.

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For more information about the contents of this guide, please contact predict@ucdavis.edu.

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*Adapted from the *USAID STOP-AI Training Module: Introduction to PPE*

Section 4.1. Learning Objectives and Confirmation

After studying this guide, you will be able to:

- Implement basic biosafety precautions.
- Describe the factors to consider when assessing the biological risk of handling animals and collecting human and animal samples, and other field and laboratory activities that may have potential risk for zoonotic disease exposure.
- Understand factors to consider when choosing appropriate PPE based on identified risks.
- Identify and describe the functions of each component of PPE.
- Correctly put on and take off appropriate PPE for PREDICT sample collection and handling activities in a non-outbreak setting. For collecting samples from hospital and clinic patients and during disease outbreaks, specific PPE components and procedures to put on and take off PPE should be adapted based on the determined risk level.
- Describe the importance of respirator fit and fit testing.

Confirm you understand the material of this guide:
When you are familiar with the information in this guide, take the PREDICT quiz in ***Section 8.4.3. Biosafety and PPE Use***.

Section 4.2. Biosafety Overview

Personal Safety Responsibilities

- Individuals have the primary responsibility for their own health and safety. Nothing substitutes for good training and vigilance.
- Follow safety procedures outlined in PREDICT protocols regarding each activity that involves potential exposure to infectious pathogens.
- Use appropriate safety equipment.
- Report unsafe or hazardous situations, injuries, and accidents immediately to your supervisor or instructor.
- Report any illness to your PREDICT supervisor.
- Participate in required safety training.

Follow PREDICT waste disposal procedures (see ***Basic Laboratory Safety (Section 6.3.)*** *and* ***Safe Disposal of Carcasses and Infectious Waste Guide (Section 2.5.)***) consistent with the ***PREDICT Environmental Mitigation and Monitoring Plan (Section 2.4.)***.

Responsibilities of the Country Coordinator and Field Supervisors

- Provide and document training for all personnel who will participate in PREDICT project activities.
- Ensure compliance with relevant PREDICT or organizational task protocols.
- Ensure compliance with the PREDICT Environmental Mitigation and Monitoring Plan.
- Ensure compliance with local permit requirements and regulations.
- Report injuries/accidents and ensure compliance with associated mitigation.
- Ensure that all field personnel are trained on the safe use of field equipment.

General Zoonoses Biosafety Precautions

There is a risk of exposure to pathogens, including zoonotic pathogens, when handling animals, and human and animal samples in the field. Therefore, it is important to implement measures to minimize the risk of pathogen transmission.

The following list of general precautions applies to most situations:

- Inform all who enter potential zoonotic pathogen risk areas of their potential for exposure and the associated risks.
- Review information regarding the zoonotic agents likely to be found in the samples or animals to which you or others may be exposed.
- Wear the appropriate PPE based on protocols for the activity and species and as directed by the Country Coordinator or Field Supervisor.
- Use disposable supplies whenever possible.
- Wash hands and wrists after removing your gloves.
- Don't wear field or lab clothing or shoes outside of work areas where there may be zoonotic pathogen exposure. Change clothing and shoes before getting into your vehicle.
- Launder contaminated protective clothing at work. Don't take your protective clothing home with you.
- Never eat or drink in areas where human sampling, animals, their wastes, or their products (e.g., blood) are present.
- Wash your hands frequently and practice good hygiene. Avoid touching your face while working with animals, human and animal samples, or other sources of pathogens. Although a normal, healthy adult person may have only mild symptoms of a zoonotic disease, that person may unknowingly spread the disease to others. Unfortunately, animal handlers have "carried home" zoonotic pathogens to their infants with fatal consequences. Therefore, good hygiene is not only to protect the person working directly with human and animal samples; but it is also for all persons and animals with whom they have contact.
- When seeking medical advice for any illness, inform your physician of your work with humans and animals.
- Make sure a first aid kit is immediately available during all field and laboratory activities.
- Refer to established procedures for how to respond to a bite, cut, scratch, puncture or other injury that results in possible zoonosis exposure.

- Refer to established procedures for disinfecting all equipment, samples, cages, and traps according to guidance provided below.

Hand Washing - Teach and Practice Good Hand Washing Technique

The importance of hand washing in preventing infection and the spread of infectious pathogens cannot be over emphasized.

Always wash your hands before:

- Putting on PPE for handling animals or collecting or handling human and animal samples
- Contact with a sick or injured person or animal
- Treating wounds or administering medications
- Preparing food
- Eating
- Inserting or removing contact lenses

Always wash your hands after:

- Taking off PPE
- Touching an animal, human and animal samples, waste, products or animal equipment
- Collecting and handling diagnostic samples
- Visiting field sampling sites or clinics/hospitals
- Preparing foods, especially raw meat or poultry
- Using a toilet
- Changing a diaper
- Blowing your nose, coughing or sneezing into your hands
- Treating wounds
- Touching a sick or injured person
- Touching garbage or other potentially contaminated materials
- Finishing work in the laboratory

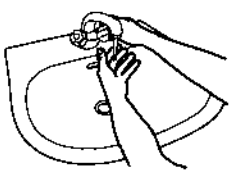
Plan for hand washing:

- Plan for hand washing in the field by identifying any locations with running water near the site and bringing supplies (i.e., water, soap, bucket, paper towels, hand sanitizing gels and germicidal wipes that contain at least 60% alcohol)
- Plan when you will need to wash to ensure supplies are ready and available

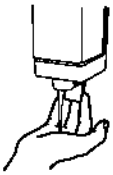
See the WHO guidelines below for proper hand washing technique. If soap and water are not available, use an alcohol-based hand sanitizing gel that contains at least 60% alcohol. These products significantly reduce the number of microbes on the skin and are fast acting. However, they are not effective if hands are visibly dirty. Organic matter and natural oils on hands create a barrier that blocks the effectiveness of the sanitizer. See http://www.cdc.gov/handwashing/show-me-the-science-hand-sanitizer.html for more information.

How to Hand

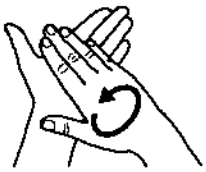
Duration of the entire procedure:



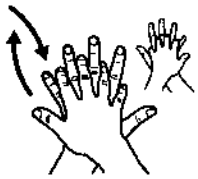
Wet hands with water;



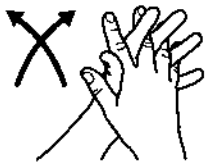
Apply enough soap to cover all hand surfaces;



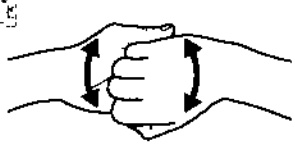
Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



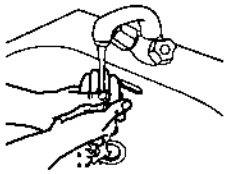
Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;

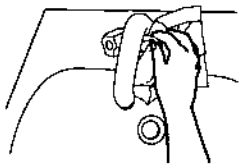
Rotational rubbing of left thumb clasped in right palm and vice versa;

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

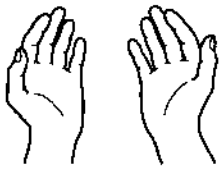


Rinse hands with water;

Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

Disinfection of Surfaces and Materials

Dirt and organic matter can protect microbes from decontaminants (antiseptics, chemical germicides and disinfectants). Therefore, precleaning contaminated surfaces as well as reusable supplies, equipment and PPE is important to achieve proper disinfection. Precleaning should be carried out cautiously to avoid exposure to pathogens.

Contact times for disinfectants are specific to the type of solution and the manufacturer. Therefore, it is important to follow the manufacturers' specifications. Further, solutions used for precleaning and disinfection should be the same or chemically compatible.

There are several types of disinfectants on the market and formulations should be selected for specific needs. High temperatures can degrade chemical disinfectants, so shelf-life may be decreased in areas with high ambient temperatures.

Chlorine bleach or Virkon disinfectant solution are commonly used as general-purpose disinfectants. See the WHO Laboratory Biosafety Manual (http://www.who.int/csr/resources/publications/biosafety/en/Biosafety7.pdf) for frequently used classes of disinfectants, with general information on their applications and safety profiles, as well as recommended dilutions for chlorine-releasing compounds, such as chlorine bleach.

Section 4.3. Assessing Biosafety Risk of Zoonotic Pathogens and Selecting PPE

Key to the practice of biosafety is assessing the risk of infection associated with a specific procedure under specific environmental conditions. There are many considerations in the assessment of risk and it is the job of the supervisor to weigh these considerations to determine the appropriate measures to protect humans and animals from infection.

Factors to Consider when Assessing Biological Risk of Procedures to Determine Necessary PPE

1. Species to be handled and sampled.
2. Pathogens likely to be present in these species/samples.
3. Pathogenicity of these pathogens (see WHO classification of infective microorganisms by risk group below).
4. Potential exposure opportunities and routes of infection for the pathogens given the planned activity.
5. Potential result of exposure to the pathogens.
6. Estimated infectious dose and stability of the pathogens in the environment.
7. Information available in the literature, including animal studies and clinical reports that would help inform on risk.
8. Measures to reduce the risk of exposure, such as sanitary measures (e.g., food and water hygiene) and control of animal reservoirs or arthropod vectors, the movement of people or animals, and the importation of infected animals or animal products.
9. Local availability of effective prophylaxis and treatment. Prophylaxis may include vaccination or antisera. Treatment options may include passive immunization and post-

exposure vaccination, antibiotics, and chemotherapeutic agents, taking into consideration the possibility of the emergence of resistant strains.

Based on the risk assessment considering the factors listed above, the following should be determined by the PREDICT activity supervisor (often Country Coordinators):

1. Hazards and risk of exposure.
2. Appropriate PPE required to implement the activity safely and to prevent transmission of infectious pathogens. (Components of PPE to consider are discussed later in this document).
3. Special procedures, such as disinfection procedures between handling individual animals and people or between site visits, that may be required to reduce risk of transmission and provide adequate protection for humans and animals.
4. Vaccinations or prophylaxis required for PREDICT personnel before the activity.

World Health Organization (WHO) Classification of Infective Microorganisms by Risk Group (2004)

WHO provides the guidelines below for classifying biological risk categories, based on pathogenicity of the organism and modes of transmission and host range of the organism. These primary factors are affected by existing levels of immunity, density and movement of host population (human or animal), presence of appropriate vectors and environmental conditions, and availability of effective preventive measures and treatment. Countries usually adopt a similar set of risk categories. The WHO risk group classification was developed for laboratory work. See **http://www.absa.org/riskgroups/** for more information and a link to the Risk Group Database where information on risk can be obtained for specific microbes and/or microbe families.

The WHO risk categories are:

WHO Risk Group 1 (no or low individual and community risk) -- A microorganism that is unlikely to cause human disease or animal disease.

WHO Risk Group 2 (moderate individual risk, low community risk) -- A pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventative measures are available and the risk of spread of infection is limited.

WHO Risk Group 3 (high individual risk, low community risk) -- A pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available.

WHO Risk Group 4 (high individual and community risk) -- A pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.

Appropriate PPE for PREDICT Activities

While PREDICT field staff will be working in very different environments with varying levels of biological risk, there are some tasks for which **minimum PPE requirements** have been established and detailed in Table 1.

Table 1. Minimum PPE to wear for some PREDICT Tasks:

Taxa/Task	Respirator (N95 or respirator with comparable filtering rating	Goggles, Face shield or protective glasses	Gloves*	PPE Coveralls or Dedicated Clothing with washable shoes
Handling human and animal specimens	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling primates (live or carcass)	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling rodents or bats (live or carcass)	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Sampling in bat caves	Yes	Yes	Yes	PPE coveralls
Sampling or necropsy of sick/dead animals	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing) with apron
Sampling bushmeat	Yes	Yes	Yes	Yes (either PPE coveralls or dedicated clothing) with apron
Handling poultry or waterfowl	Yes	Yes	Yes	Yes (either PPE or coveralls or dedicated clothing)
Handling livestock	Depends**	Depends**	Yes	Yes (either PPE or coveralls or dedicated clothing)
Sampling apparently healthy humans	Depends***	Depends***	Yes	Depends***
Collection of animal feces or urine from the environment	Depends****	Depends****	Yes	Depends****
Sampling an animal once it has been anesthetized	Recommended if in close contact with the animal during sampling activity	Recommended for those in close contact with the animal during sampling activity	Yes	Yes (either PPE or coveralls or dedicated clothing)

Table Definitions

* When handling live animals that pose a bite or scratch risk, it is recommended that leather gloves be worn above nitrile gloves for added protection. Nitrile gloves are more puncture resistant than latex and may reduce the risk of exposure from a bite or scratch. In many cases chemical restraint (anesthesia) is recommended to prevent injury to either the handler or the animal during sample collection.

** It is recommended to use a respirator, full protective clothing and eye protection when in contact with livestock suspected of harboring a biohazardous agent and pregnant livestock or livestock recently giving birth, and upon entering and/or working in abattoir settings or other settings where livestock are being slaughtered and/or butchered.

*** For routine sample collection from apparently healthy people, gloves are recommended. For collecting samples from hospital and clinic patients and during outbreaks, PPE should be adapted based on the determined risk level.

**** In some cases, such as during the collection of urine underneath a colony of fruit bats roosting in trees where there is a high risk of aerosolizing of excreta and microbial agents, then it is recommended to use a respirator (N95 respirator is recommended as the minimum level of protection), full protective clothing and eye protection.

Higher Risk Taxa

Below is a summary of special biosafety considerations for some of the key groups of species (bats, rodents, and non-human primates) to be handled as part of PREDICT activities.

Rodents, bats, non-human primates and other wild species may harbor pathogens that are transmittable to, and highly pathogenic in, humans. When handling these rodents, bats or non-human primates, careful consideration needs to be given to conscientious use of PPE, good personal hygiene (i.e., hand washing), safety training, and application of good animal handling and sampling techniques to minimize exposure to infection or injury.

In the event of an injury while handling animals that pose risk of zoonotic pathogen exposure, appropriate first aid must be applied. The risk of infection can be significantly reduced with immediate and thorough scrubbing of the wound with soap or antiseptic.

Vaccination to prevent rabies infection: Personnel who are handling animals that are known reservoirs for rabies (i.e., bats and dogs) should be immunized against rabies virus according to World Health Organization and CDC recommendations.

Investigators should familiarize themselves with known biohazards specific to species under study and with the procedures for the isolation and control of zoonotic pathogens.

Specific considerations with regard to working with rodents, bats and non-human primates are discussed below:

Rodents

Wild rodents have the potential to carry a variety of zoonotic bacteria and viruses that can be passed on to those handling them. Because of the serious consequences of becoming infected, personnel must always follow good personal hygiene and animal handling procedures and use the provided PPE to protect against exposure.

Special Precautions:

- Wear the minimum PPE for handling rodents including an N95 mask, eye-protection, gloves and coveralls, or clean dedicated clothing.
- Personnel who are handling animals should be immunized against rabies virus according to the World Health Organization and CDC recommendations.

Bats

Exposure to wild bat roosts (in caves or trees), handling of bats in the field or handling bat excreta (urine or feces) presents a potential for exposure to zoonotic pathogens. Rabies, Nipah virus, Ebola virus, and the fungal disease histoplasmosis are examples of zoonotic pathogens carried by some bat species. Bat bites, scratches and wound and mucous membrane exposure to bat saliva are the ways in which rabies can be transmitted. Spores of histoplasmosis can be present in soil and debris enriched with bird and bat droppings. When this dry soil is disturbed, spores can become airborne and cause infection by inhalation.

Special Precautions:

- When working around bats in enclosed spaces, such as in a cave, wear at a minimum an N95 respirator, goggles, gloves and Tyvek coveralls (or dedicated long-sleeved clothing).
- Personnel who are handling animals such as bats should be immunized against rabies virus and be aware of appropriate post exposure prophylaxis in the case of bites according to World Health Organization and CDC recommendations.

Non-Human Primates

Non-human primates may be infected with a number of potentially serious zoonoses. For example, all macaque monkeys and their fluids should be considered to be infected with **Herpes Simian B virus**. Marmosets, although they do not carry the herpes B virus, can carry other disease agents that affect humans such as lymphocytic choriomeningitis virus and *Trypanosoma cruzii,* the cause of Chagas' disease. It is critical that work with non-human primates be done while wearing the appropriate personal protective equipment and with the well-established safe protocols and procedures.

Special Precautions:

- Personnel must follow strict hygiene procedures. Frequent and thorough hand washing, although too often overlooked by the staff, is critical to physically remove bacterial contamination and prevent ingestion exposure.
- PREDICT personnel must wear the minimum PPE for handling non-human primates including an N95 mask, eye-protection, gloves and coveralls or clean dedicated clothing.

Section 4.4. Use and Disposal of PPE

Considerations When Using PPE

Personnel wearing PPE may experience heat stress and general discomfort in hot or humid environments. It is important to remain hydrated by drinking adequate water before and after wearing PPE. Length of time wearing full PPE should be limited, based on environmental conditions, to avoid the risk of heat exhaustion or heat stroke. Personnel should inform their supervisor(s) if they experience severe discomfort during animal capture or sampling activities, so that they may take a break.

When workers are heat-stressed, uncomfortable, or unable to see out of their fogged goggles, they are more likely to remove their goggles or mask in risky environments, exposing themselves to potential pathogens.

Most PPE items to be worn during PREDICT activities are disposable and designed to be used only once, and should be properly disposed of as medical waste after each use. Plastic goggles and rubber boots may be re-used, but must be disinfected between each use.

Designate a clean area for putting on PPE. It should ideally be a clean area away from any potentially contaminated animal equipment, such as cages, crates, or farm tools. All personnel should use this area to put on their PPE. Also, designate a decontamination and PPE removal site.

Always wear the respirator properly when you are working. Ensure that there is a tight seal formed around the mask and never hang it around your neck.

When wearing coveralls, ensure there is no exposed skin between your sleeves and gloves. If any piece of PPE is torn, it should be changed at the PPE decontamination site as soon as possible following the steps outlined in the section on how to take off PPE.

It is beneficial to have a colleague confirm that PPE is properly worn. Working in teams when putting on and removing PPE can help avoid mistakes and react immediately if accidents occur.

Planning and Preparations for PPE Use

1. Prior to going to the field, the level of risk for the field tasks and the appropriate PPE needed to safely perform the field tasks should be determined.
2. PPE kits should be assembled for each person who will be involved in the field tasks. Multiple kits per person may be required, based on the number of animals to be handled, the number of breaks that personnel may take, and to account for potential tears in gloves and coveralls, etc.
3. Prior to going to the field, PPE supplies should be organized. Along with required sets of PPE, supplies should include disinfectants, alcohol-based hand sanitizing gel and germicidal wipes, large color coded bags for infectious waste disposal according to national codification, and collection bags for equipment (such as plastic goggles, face shields and rubber boots) that will be disinfected for re-use.
4. Bottled water should be available for consumption before and after use of PPE. PPE can be very hot, and personnel are more likely to suffer heat stress if they do not consume adequate amounts of water.
5. Bring additional tape and extra collection and disposal bags. Tape can be used to secure shoe covers and protective clothing and seal bags.
6. Plan for disposing of PPE:
    a. An area for removing PPE should be identified. This area should be away from the contaminated area and away from animals. All personnel should use this area to remove their PPE.
    b. Remove all of your PPE carefully, following the recommended steps for PPE removal (below) and discard them (or put reusable items in bags for disinfection) before taking a break. Put on a new set after the break.
    c. Immediately after removing PPE, place it directly into the color coded infectious waste bag (or marked biohazard waste bag).
    d. Color coded infectious waste bags should be sealed and properly disposed. Follow the instructions of the local officials or person supervising the work on where to dispose infectious waste bags when they are full.
    e. Disposal methods (such as burning or burial) may differ by situation or location. Local officials and/or those supervising the work will likely decide on how best to dispose of used PPE and other disposable items that are potentially contaminated. For guidelines, see PREDICT Safety Guide: Laboratory Operations, Environmental Guidelines for Small-Scale Activities in Africa (EGSSAA) Ch. 8: Healthcare Waste: Generation, Handling, Treatment and Disposal (http://www.encapafrica.org/egssaa/medwaste.pdf); and WHO Safe Management of Wastes from Health-Care Activities (http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/).

Components of PPE Kits

1. Coveralls, dedicated clothing and shoes, and aprons – for high-risk tasks, full coverage may be warranted. In that case, Tyvek or Tychem coveralls, shoe covers or boots, and an apron may be used. For lower-risk tasks, just an apron and/or dedicated clothing and shoes may be appropriate. An apron should be a disposable type that is properly disposed of together with

gloves and masks after each use. Dedicated clothing (e.g., cotton coveralls) at the work site should be removed and laundered after each use.

Regarding the use of Tyvek or Tychem coveralls:

- Wear these coveralls to protect your skin and/or clothing against contamination when in contact with human samples, animal droppings, dust, animal urine or droppings, or animal fluids such as blood, saliva, and mucous.
- The synthetic material Tyvek is water resistant and Tychem is water proof, so even if the coveralls get dirty or wet, they will offer protection. Tychem offers more protection from liquids and should be considered in situations with high risk of exposure to blood-borne pathogens (e.g., hemorrhagic disease, EVD outbreak investigations).
- You can wear your dedicated shoes and clothing under the coveralls.

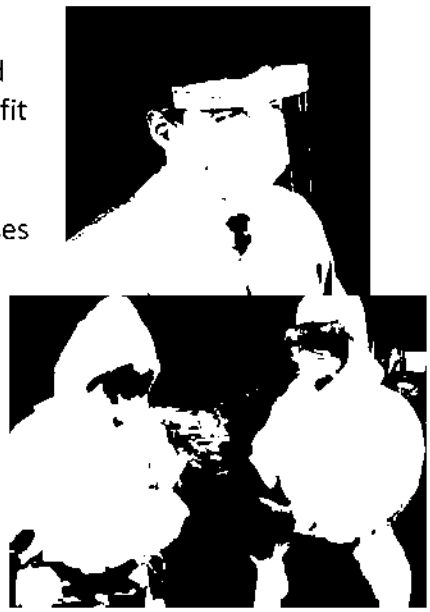
2. Shoe Covers or Washable Rubber Boots

- Because pathogens in human and animal samples including feces, secretions, or blood can easily contaminate your footwear, it is important to have disposable shoe covers or rubber boots that can be disinfected.
- The shoe covers provided in some PPE kits fit over your coverall feet, or over your shoes.
- Rubber boots may be worn with dedicated pants pulled over the top of them. If using PPE coveralls with rubber boots, purchase the coveralls without feet (or cut the feet off) and pull the pant legs of the coveralls over the top of the boots.
    - A footbath should be prepared with either chlorine bleach or Virkon disinfectant. This can be used to disinfect boots and other footwear upon leaving the field site. A boot brush should be available for scrubbing surfaces of footwear prior to using the footbath. It is critical to remove all organic material from footwear prior to disinfection to ensure effectiveness of disinfectants.

3. N95 Respirator

- N95 respirators (masks) protect you from inhaling droplet or aerosolized pathogens into your nose and lungs. Surgical masks are not respirators. They do not protect against aerosol and small droplets. They filter out large-size particles in the air and offer protection from large droplets and direct contact.
- There are several different models, styles, and sizes of N95 and comparable respirators that fit a variety of face shapes and sizes. Each person requiring a respirator for PREDICT activities should be individually fit tested to identify a respirator that appropriately and comfortably fits her or his face.
- Respirators with exhalation valves are generally more comfortable as the exhalation valve prevents resistance to exhalation when the filters load with dust.
- See ***Section 4.5*** on respirator use to learn more about respirators and fit testing.

4. Goggles and Face Shields



- Goggles protect your eyes from splashes and liquids.
- They are adjustable to ensure the best fit. Adjust the head strap before putting on all of the PPE. The goggles should fit snuggly over and around your eyes.
- Personal glasses are not a substitute for goggles or safety glasses; if you wear eyeglasses, the goggles or safety glasses should be placed over them.
- If ordering goggles, be sure to order fog-free goggles. If they are not fog-free, they are likely to fog up in a few minutes, rendering them useless. If all you have are non-fog-free (regular) goggles, you may rub a little soapy water on the inside of the lens prior to use to reduce fogging.
- Goggles (and rubber boots) are one of the few components that may be re-used if disinfected properly after each use.

5. Gloves

- Nitrile gloves are best for use for infectious agent exposure protection. **Gloves are a component of minimum PPE required for sample collection and handling tasks conducted under PREDICT.**
- Two pairs of nitrile gloves are recommended when using sharps.
- Heavy rubber gloves or leather gloves may be required when handling animals and can be worn over the nitrile gloves. PREDICT teams have good success with Hexarmor Hercules 400R6E gloves.

6. Disinfecting Wipes and Alcohol-based Hand Sanitizing Gel (at least 60% alcohol) -- for disinfecting gloves and hands.

- Disinfecting wipes that contain at least 60% alcohol should be used to clean your gloves and other PPE before removing them.
- Alcohol-based wipes or hand sanitizing gel can be used to clean areas of skin that may have been contaminated. It is critical to remove organic material before using sanitizers to ensure effectiveness of disinfectant.
- It is recommended that you ALWAYS disinfect and wash your hands after removing gloves, regardless of contamination.

7. Infectious Waste Bag—for the safe disposal of PPE and other medical waste.

- A color coded infectious waste bag (or otherwise labeled biohazard bag) should be available at the field site for containing and disposing of used PPE items.
- As soon as you remove a contaminated item, place it in the infectious waste bag.
- Do not over fill bags and ensure they can be closed and tied.
- Tie the bag at the top and spray the outside of the bag with disinfectant once it is closed and tied. Wet waste should be double-bagged to prevent leakage.
- Leave it at the designated collection site or place it in in a secure container for transport to a proper disposal site.
- Containers should be constructed to contain all contents and prevent leakage of fluids during handling, storage, and transport.
- It is strongly recommended that field teams do not burn or bury medical waste at the field site. Incomplete burning may leave infectious or dangerous materials, and animals or children may dig up buried waste. All bio-hazardous waste should be contained and returned to a medical center for autoclaving or incineration. **See *Section 2.5 Safe Disposal of Carcasses and Infectious Waste Guide* for information regarding guidelines for waste disposal.**

Procedure for Putting on PPE

All of the components of PPE discussed below are not necessary or appropriate for all PREDICT tasks. For instance, Tyvek or Tychem coveralls and aprons are not necessary for many PREDICT tasks. However, when investigating disease outbreaks or other potentially high-risk situations, the PPE and donning and doffing procedures may be substantially enhanced to reduce risk of exposure. See http://www.cdc.gov/vhf/ebola/hcp/ppe-training/index.html for CDC Guidelines for Personal Protective Equipment (PPE) Donning and Doffing Procedures during management of Ebola virus disease cases.

1. Wash your hands and/or disinfect them with alcohol-based hand sanitizing gel prior to putting on PPE.

2. Coveralls or dedicated clothing go on FIRST. Always start with the coveralls (which should be big and loose to fit over clothing and not restrict movement) or dedicated clothing. Be certain to zip up coveralls or button up clothing.

3. **Shoe covers or boots go on SECOND.** Shoe covers fit over the coverall feet. Pant legs of dedicated clothing and coveralls should fit over the boots.

4. **Respirator or surgical mask goes on THIRD.** Of the equipment to be worn around the head and face, the mask or respirator is always first on and last off. On a mask with a metal nose clip, be sure to form the clip around the nose for a nice fit. Any time you put on a respirator, perform a seal check by inhaling sharply. If there is air leakage around the edges of the mask, readjust to ensure a proper seal.

5. **Goggles go on after the respirator.** Goggles should fit snuggly over and around your eyes. Goggle straps should be adjusted to fit your head.

Once the respirator and goggles are in place, pull the hood on your coveralls over your head (or put on the separate head cover if the coveralls do not have a hood).

6. **Tie on the apron over the coveralls or your dedicated clothing.** Place the apron over your head and then tie it in the back.

7. **Put on two pairs of gloves.** The inner glove should go under the sleeve of the coverall to prevent exposed skin between the coverall and the glove. Coveralls with finger loops that secure the sleeve over the first pair of gloves are ideal to avoid exposure of the wrist area (or you can make a small cut in the coverall sleeve and introduce your thumb). Otherwise, tape the coverall sleeve to the inner glove. Put the second pair of gloves on over the first pair and extend the gloves over the coverall cuffs.

Procedure for Removing PPE

After completing your work, assume the exterior of the PPE is contaminated. The goal of correct removal of PPE is to minimize contact between your clothes and skin and the contaminated outer surfaces of the PPE.

1. **Wipe off any visible contamination of the PPE** using germicidal or alcohol-based wipes and dispose of the used wipe in the infectious waste bag.

2. **Remove and dispose of the apron** in the infectious waste bag.

3. **Wipe off outer gloves with a germicidal wipe and dispose of the used wipe** in the infectious waste bag.

4. **Remove boots or remove shoe covers** by holding the top and rolling them off of your feet. Place the shoe covers in the infectious waste bag. Place the boots in the equipment collection bag for disinfection and re-use.

5. **Remove the outer gloves** and place them in the infectious waste bag. Using one gloved hand, grasp the outside of the opposite glove near the wrist. Pull and peel the glove inside-out and away from the hand. Hold the removed glove in the opposite gloved hand. Then, slide one or two fingers of the ungloved hand under the wrist of the remaining glove. Peel glove off from the inside, creating a bag for both gloves. Dispose of the gloves in the infectious waste bag.

6. **Disinfect your inner gloves with alcohol-based hand sanitizing gel.**

7. Unzip and roll down the coveralls until they are inside out and place them in the infectious waste bag.

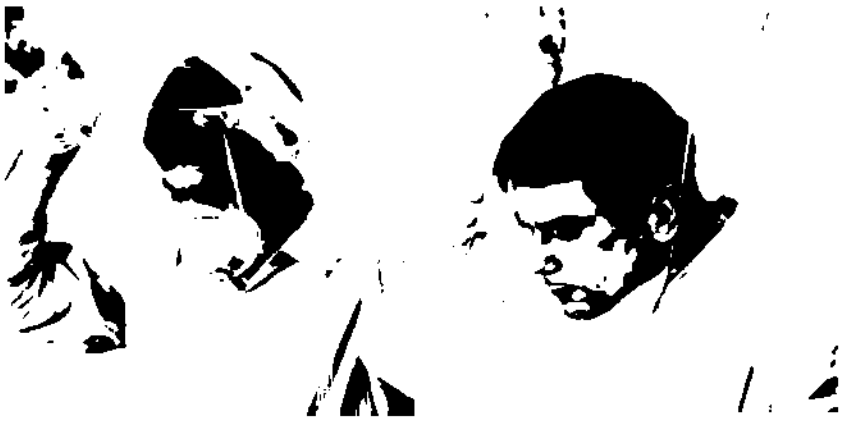
8. Disinfect gloves with alcohol-based hand sanitizing gel.

9. Remove the goggles by the strap and place them in the infectious waste bag or equipment collection bag for disinfection and re-use if re-usable. Re-suable goggles can be disinfected using a chlorine bleach solution.

10. Disinfect gloves with alcohol-based hand sanitizing gel.

11. Close the biohazard bag by tying the corners of the top of the bag together.

12. Remove the respirator by grabbing the top and then the bottom elastic bands, and pulling the bands up over your head or by grabbing the nose and pulling forward and then off. Place the respirator **in a second clean red infectious waste bag**.



13. Disinfect gloves with alcohol-based hand sanitizing gel.

14. Remove the inside gloves using the procedures listed in #5 above and place them in the second infectious waste bag. Dispose of infectious waste bags according to guidelines in Section 4, #6 e above.

15. Disinfect your hands with alcohol-based hand sanitizing gel.

16. Wash your hands and wrists using soap and running water (from a tap or poured) following the guidelines presented in Section 2.

If PPE is compromised, falls off, rips or is removed while you are handling or are exposed to biological hazardous materials, stop your current activity, remove PPE in the designated area, and wash or disinfect the exposed skin/surfaces. In addition, immediately inform your supervisor to determine if prophylaxis is indicated.

Section 4.5. Respirator Use

- Using respirators alone will not fully protect you from acquiring an infection – the respirator must be used in combination with all of the other PPE components.
- Each person using respirators must be fit tested to identify a respirator that he or she can comfortably and securely wear. Fit testing is a process that takes approximately 15-20 minutes to complete and should be performed for each member of the field team before he or she uses any respirators in the field. Qualitative fit test kits are available for purchase through 3M. A video on fit testing is available online at **https://www.youtube.com/watch?v=7IAsoU6h-8g**. After passing a fit test with a respirator, you should always use the same make, model, style, and size of respirator that was found during the fit test process to create an effective seal around your face. If you have facial hair, it is unlikely that you can properly fit a disposable particulate respirator. Workers who cannot ensure a proper fit because of facial hair or other fit limitations should consider a loose-fitting (i.e., helmeted or hooded) powered air purifying respirator equipped with high-efficiency filters. More information on respirators and respiratory protection can be found at: **https://www.osha.gov/SLTC/etools/respiratory/index.html**.
- Do not use or provide others with respirators without instruction on the health risks associated with them. For example, workers with respiratory problems may not be able to wear these respirators. Anytime someone indicates they are having trouble breathing while wearing a respirator, they should go to the PPE removal site and remove their respirator.

- When disposable particulate respirators become wet from saliva, sweat, or respiratory secretions, they lose their protective properties and must be changed.
- If a respirator is splashed and becomes wet, it should be changed using gloves and the gloves disinfected or washed following hand washing procedures.
- Respirators should be discarded and replaced after 4-6 hours of use.
- Respirators should not be hung around your neck when working. Always wear them when working.

Section 4.6. References

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Drazenovich, N., 2006. Biological Safety & Medical Waste Management Training Module. Environmental Health and Safety, University of California, Davis,

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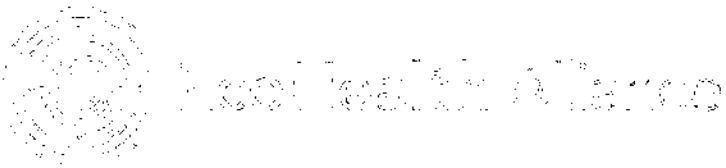

August 28, 2019

To Whom It May Concern:

Please find enclosed our technical proposal, ***Reducing the Threat of Middle East Respiratory Syndrome Coronavirus and Avian Influenza in Jordan & Strengthening Regional Disease Surveillance Capacity*** (**HDTRA1-14-24-FRCWMD-BAA WMD, GRANT12862917**). We request that this Phase II application be assigned for review by the Defense Threat Reduction Agency, Biological Threat Reduction Program Thrust Area 6 Cooperative Counter WMD Research with Global Partners.

This project proposes the first multi-disciplinary One Health research project to identify factors which allow or facilitate the transmission of Middle East Respiratory Syndrome Coronavirus (MERS-CoV), avian influenza (AI), and other infectious agents which spread from animals to humans in Jordan, while simultaneously strengthening local capabilities for prevention, detection, and reporting of these diseases in Jordan, Iraq, and Lebanon. To fill this gap and contribute to biological threat reduction, we have designed a hypothesis-driven One Health research project to characterize exposure risks for high consequence zoonotic diseases in Jordan along with capacity-building cross-trainings to be conducted with visiting laboratory scientists from Iraq and Lebanon. This multifaceted One Health approach will advance scientific knowledge on the risk of MERS-CoV, AI, and other zoonoses in Jordan, strengthen local zoonotic disease surveillance capabilities, and enhance scientific partnerships in Jordan, Iraq and Lebanon to prevent, detect, and report MERS-CoV, AI, and other zoonotic threats.

We thank you for your consideration of our request.

Sincerely,

William B. Karesh, DVM
Executive Vice President for Health and Policy

EcoHealth Alliance
460 West 34th Street, Suite 1701
New York, NY 10001-2320
212.380.4460
EcoHealthAlliance.org

Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

(b)(6) EcoHealth Alliance

Project Kick-Off, 2021-08-17

Agenda

- Presentation (<30 min)
  - Introduction and Team
  - Technical review: Data and Algorithms
  - Project approach, management, and communication
- Discussion (~30 min)

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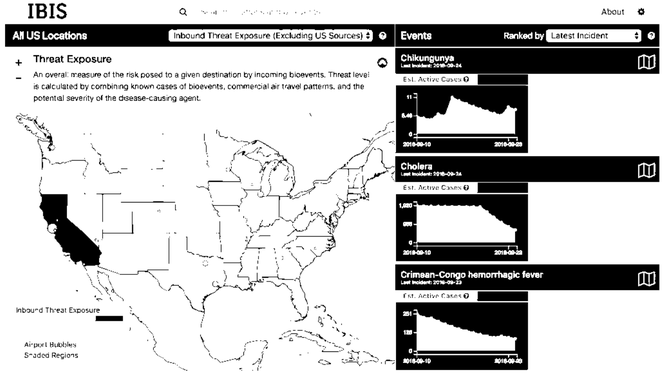
- Non-profit focused on research and prevention of emerging infectious disease
- High-impact field, lab, and analytical research
- Science-informed policy advisory and tool development
- Extensive network of over 60 collaborating agencies and organizations, nationally and globally

Applied tool-building for disease surveillance and discovery



Policy advisory via a global network of partners

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High-Impact Scientific Outputs

Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface

WORLD BANK GROUP

Global collaborations

The EHA Computational Sciences Team

- A machine-learning and computational epidemiology team within EHA
- Complements our applied and basic field and lab research, advisory, and partnerships
- Tight integration and collaboration with biological and behavioral teams
  - Additional project oversight: (b)(6)

(b)(6)

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Technical Review: Core Questions

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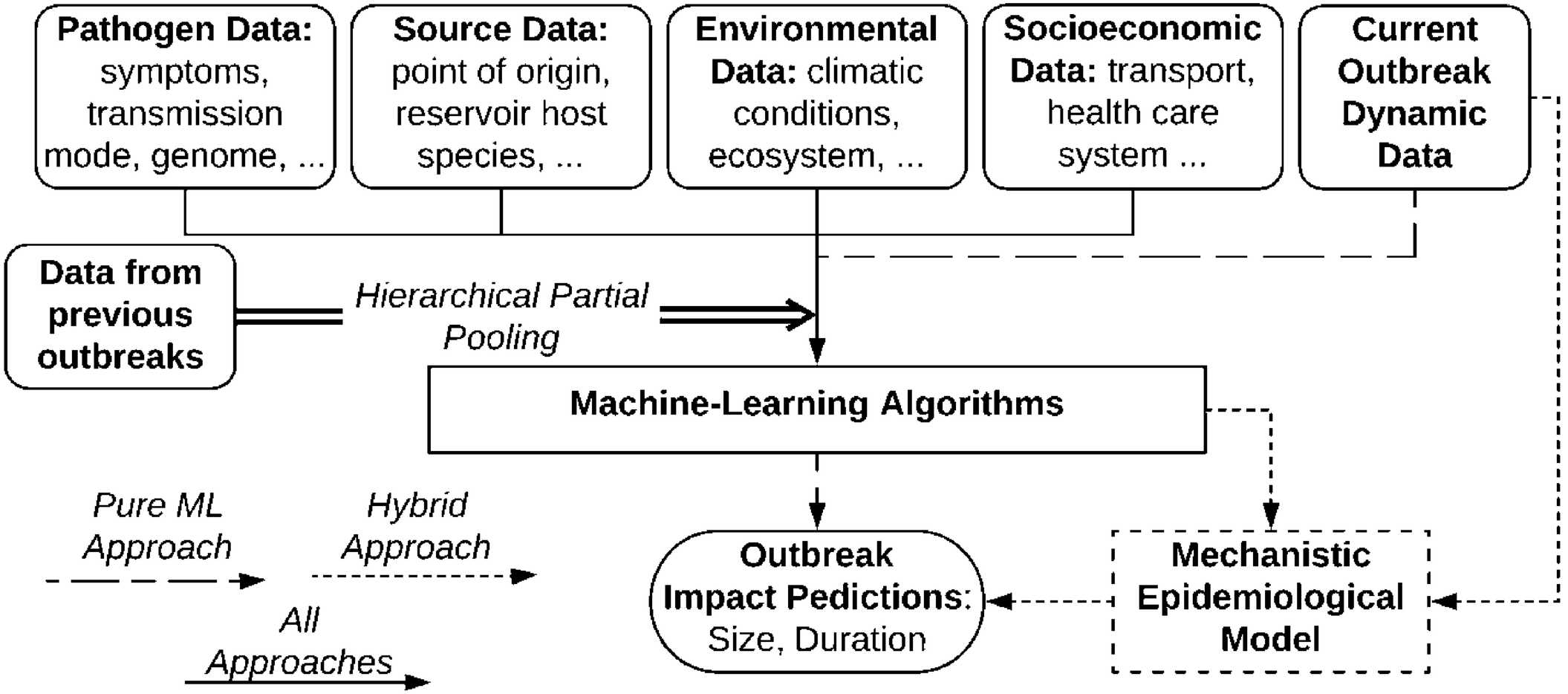
Q2: How well well does partial pooling across different diseases improve predictions?

Modeling Approach



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Previous DTRA Investments

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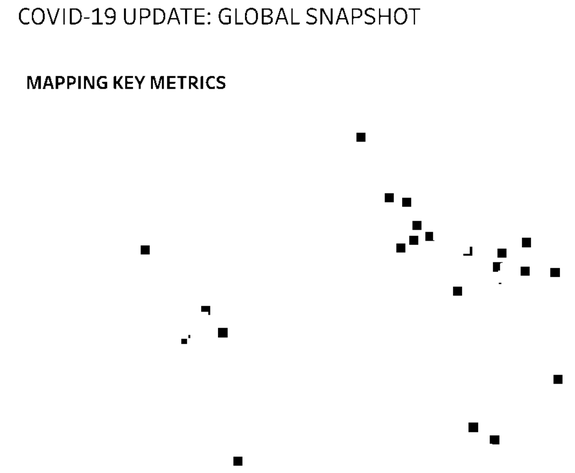

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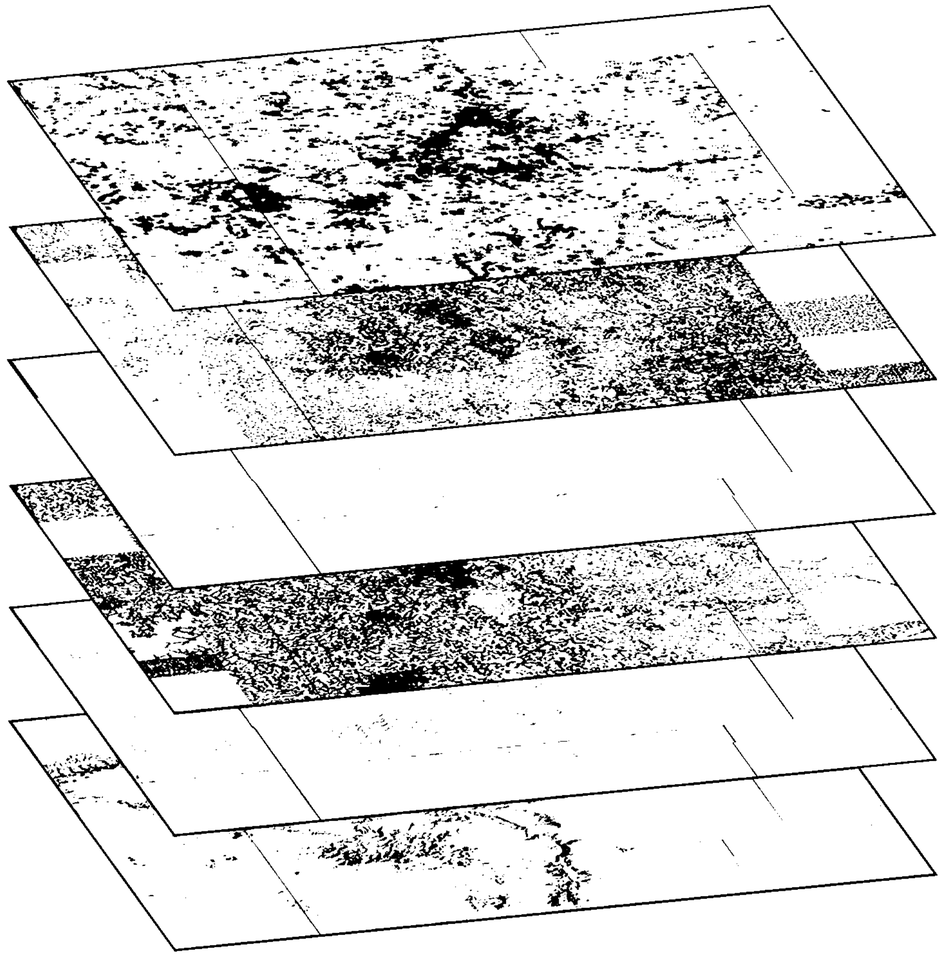

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We use and compare two general approaches with different strengths

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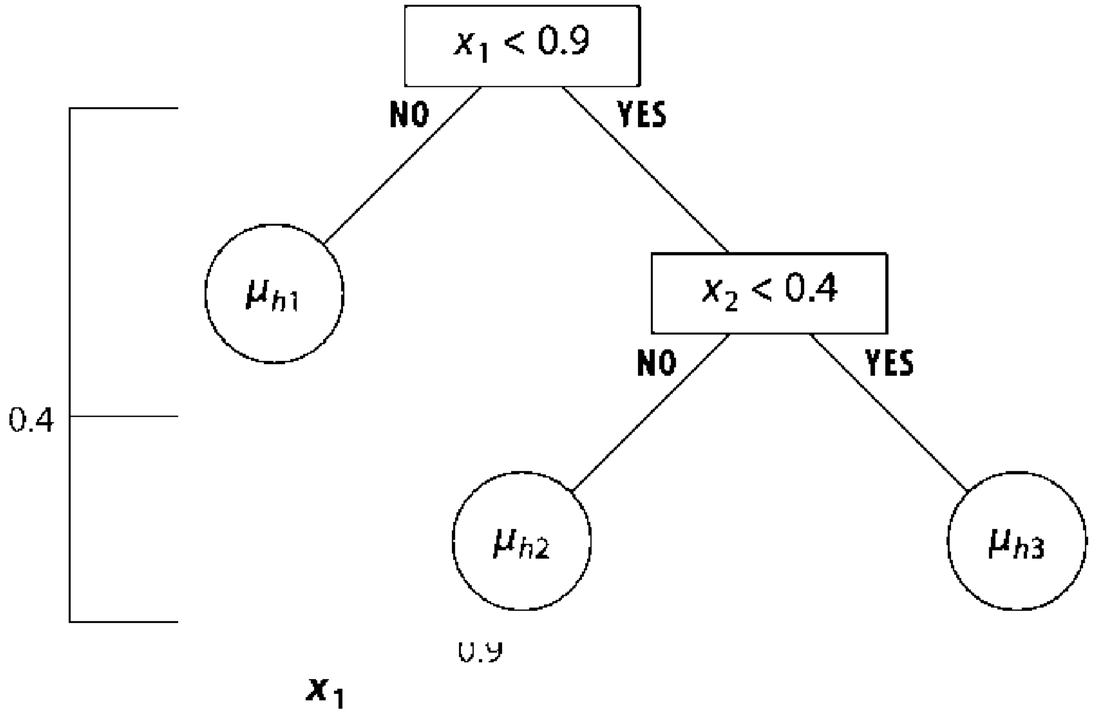

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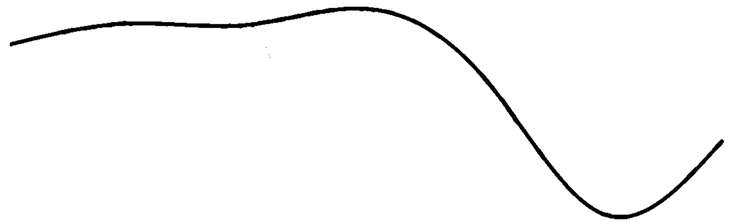

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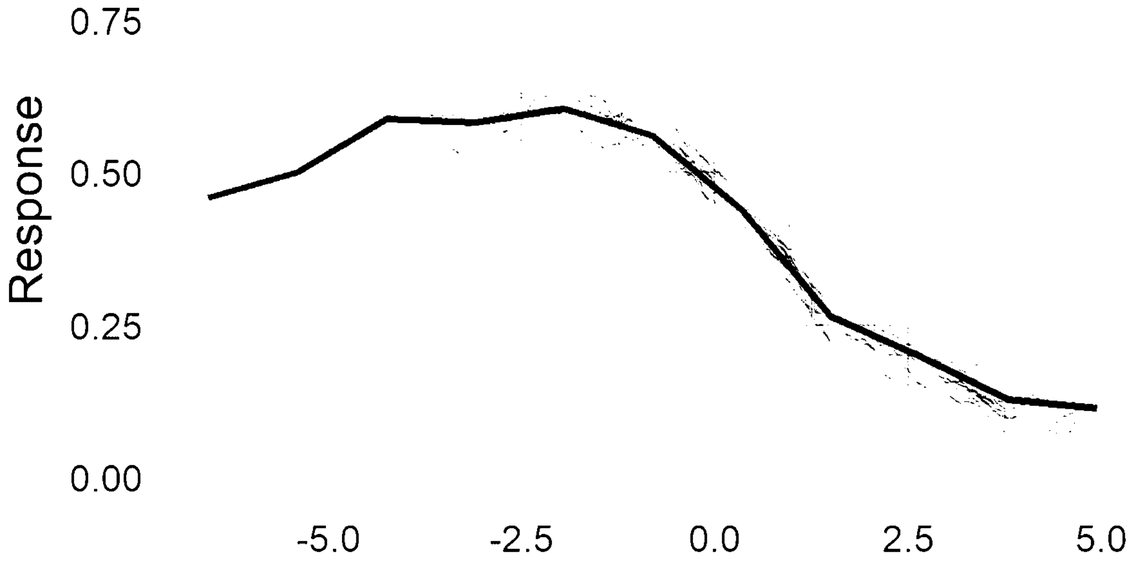

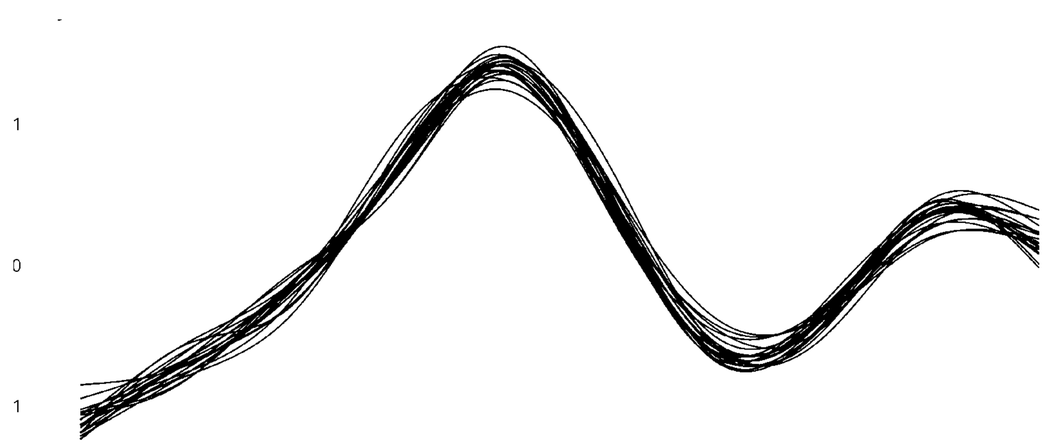

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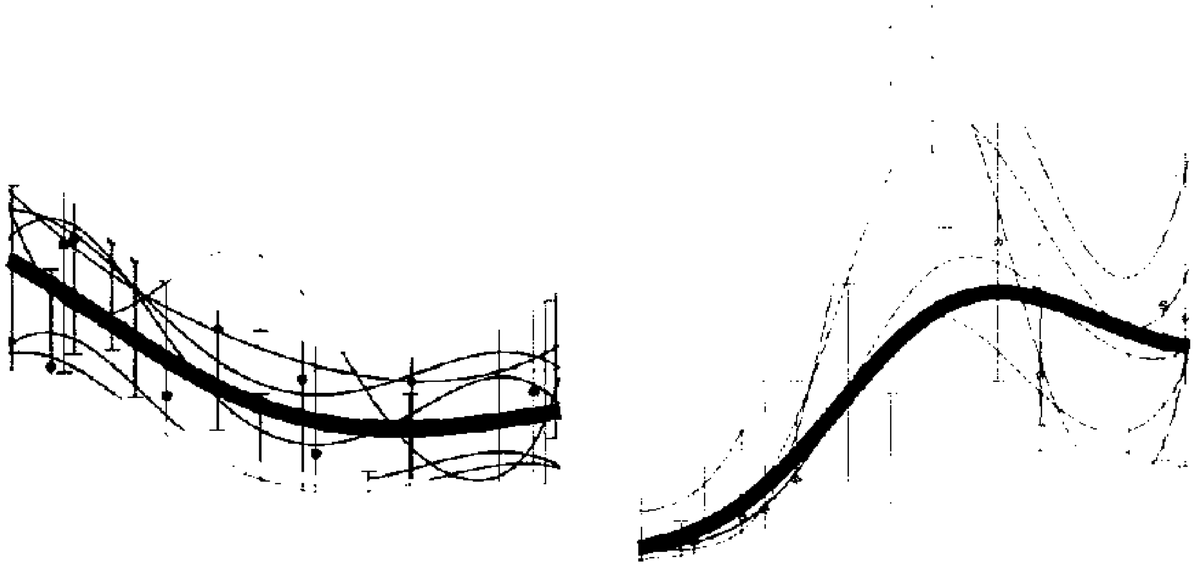

Year 2 Options: Mechanistic Models, Genomic Data, Interactivity

Q3: How do hybrid machine-learning / mechanistic models compare to pure models in performance

Q4: Can genomic data improve early-stage outcome predictions?

T1: Build an interactive interface to generate forecasts

Approach: Deployment-Ready R&D

- Principled validation approaches
  - Practical, real-world performance baselines
  - Differential privacy-based hold out testing
- Design for rapid application
  - R&D in portable computing containers
  - Release-ready data and models with APIs

Project Work Plan

	Year 1 S1	Year 1 S2
Data and Infrastructure Engineering	Database design and population, feature engineering	Refinement and linking
Algorithm Development	Performance metric design	Core model development
Interface Development		Static performance reports

Iteration, documentation, and reporting

Detail: SOW P. 7

Reporting and Deliverables

- Monthly status reports and cost statements
  - Semi-annual milestones
- Annual technical reports
- Source code and project databases
- Publications and conference papers

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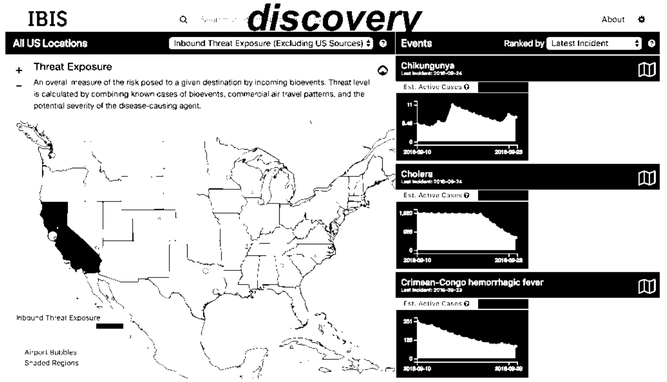

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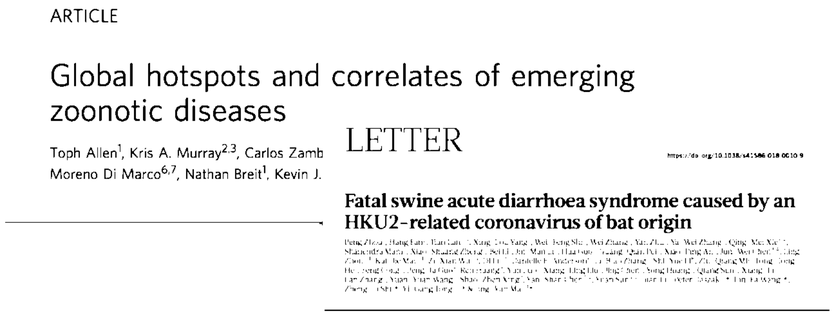
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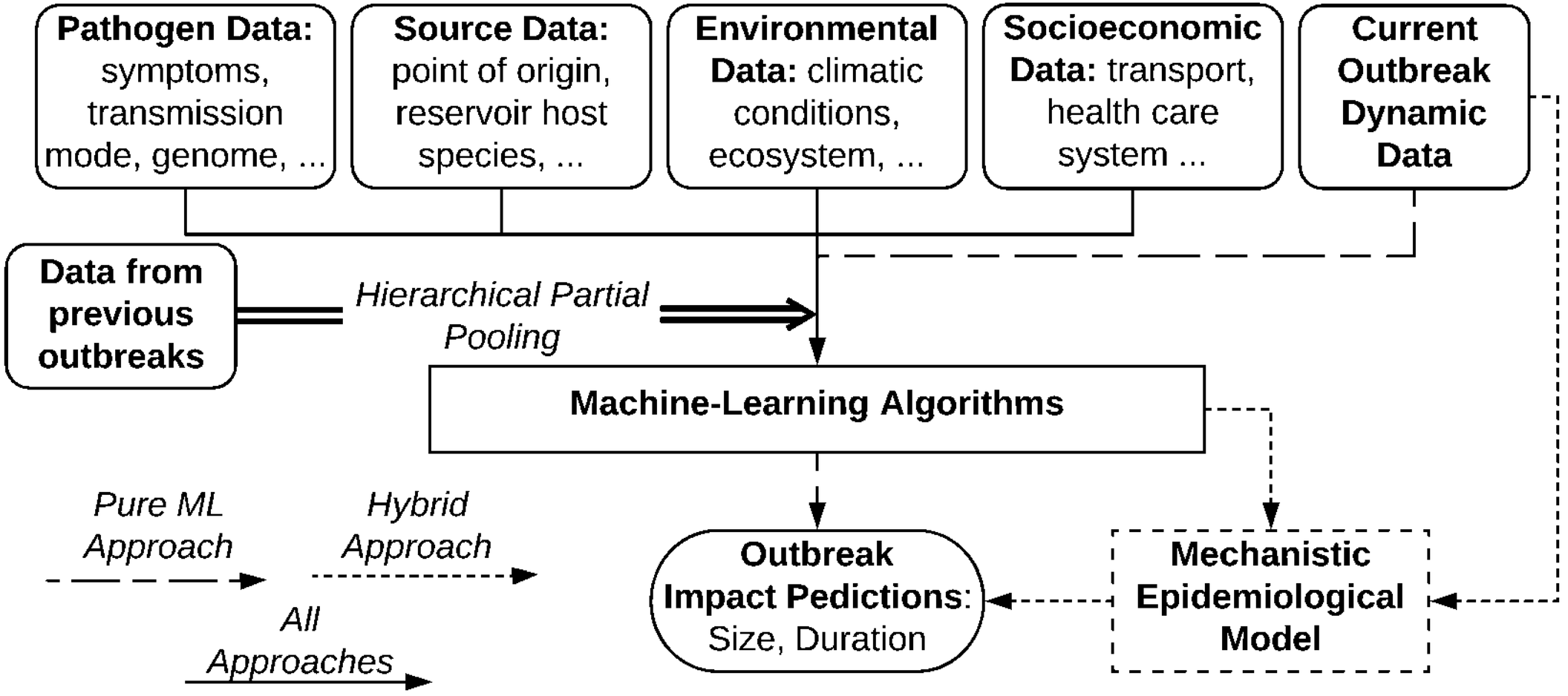

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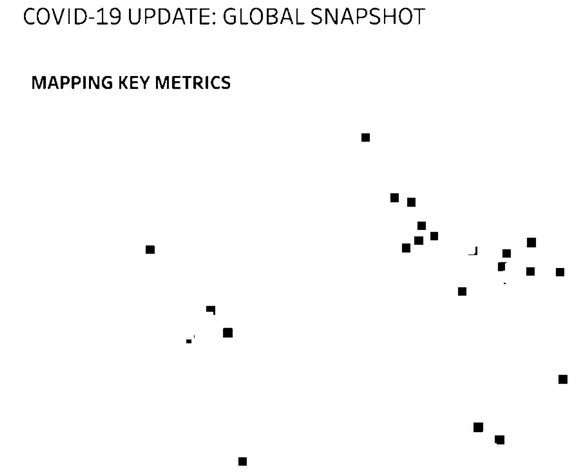

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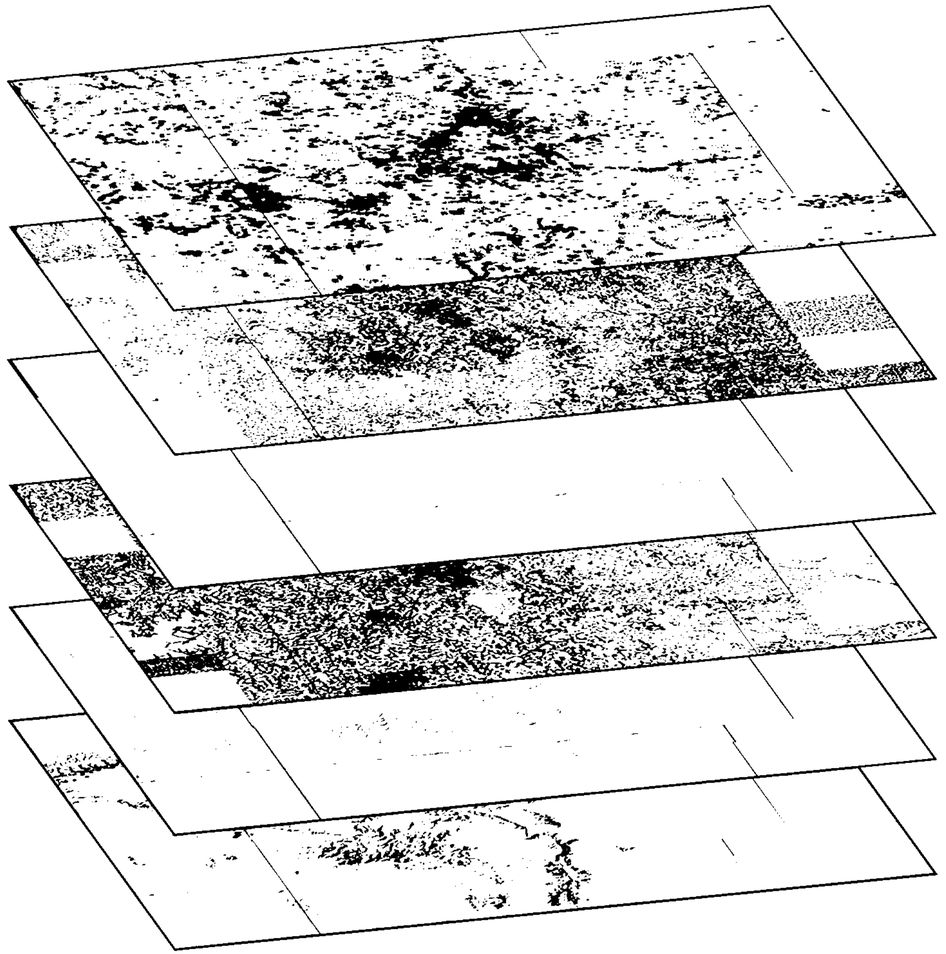

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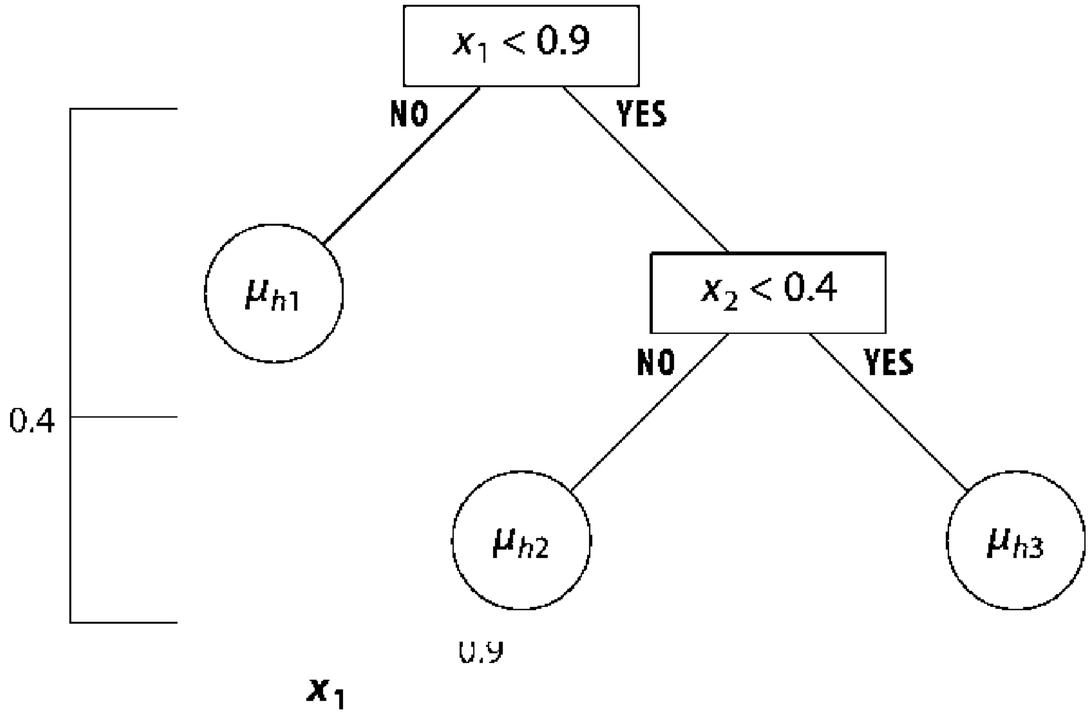

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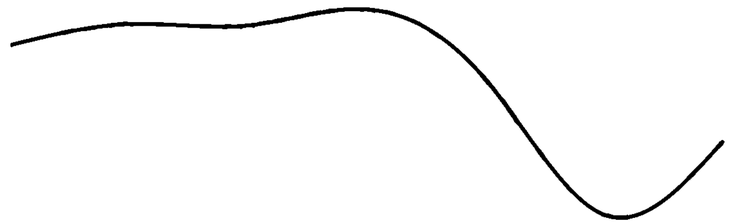

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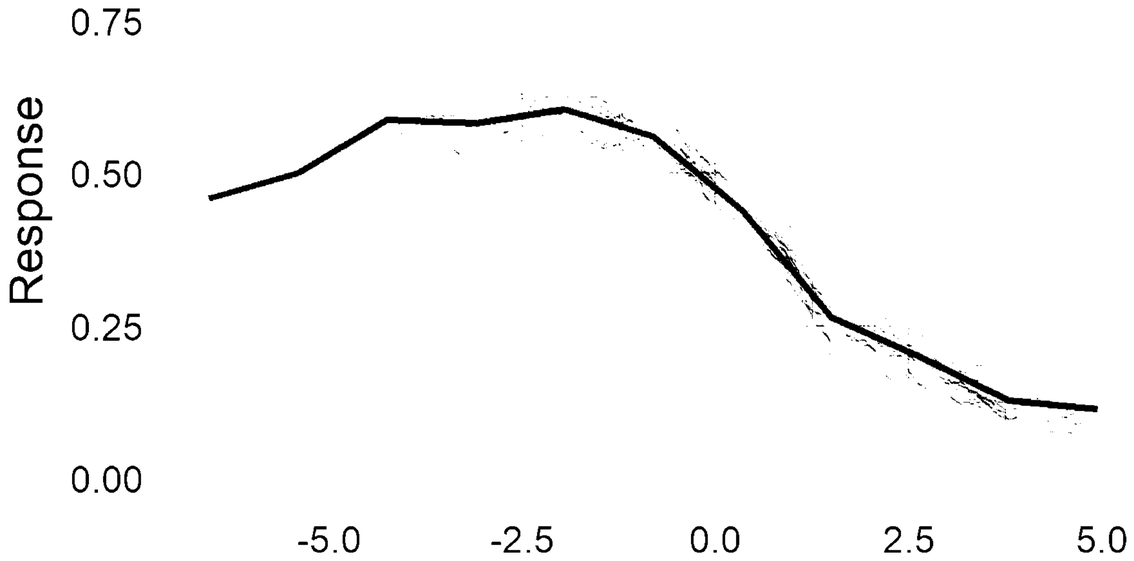
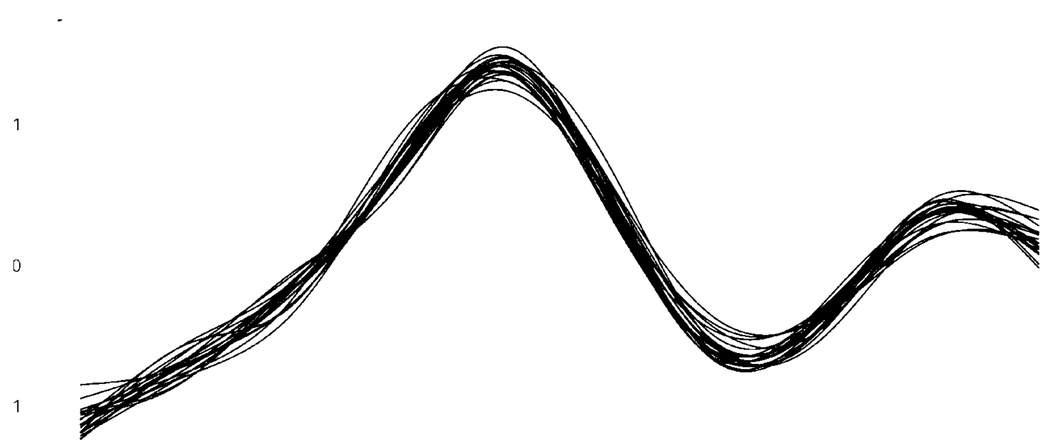
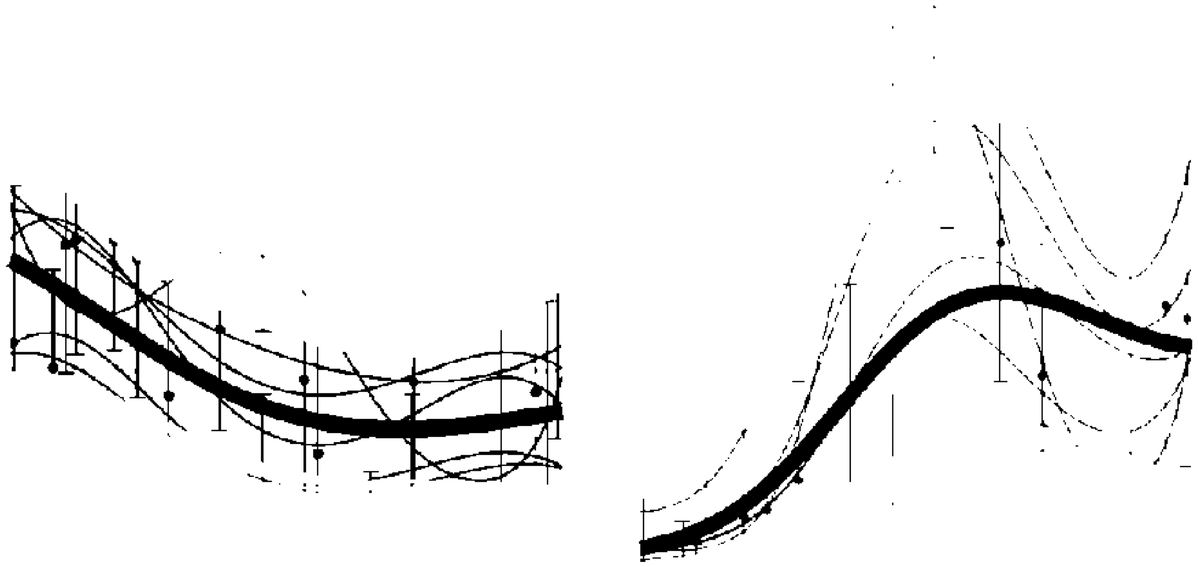




Algorithms: Partial Pooling

Partial Pooling *allows us to capture relationships that are shared across diseases while letting the data guide how much information and transfer*



Year 2 Options: Mechanistic Models, Genomic Data, Interactivity

Q3: How do hybrid machine-learning / mechanistic models compare to pure models in performanceQ4: Can genomic data improve early-stage outcome predictions?T1: Build an interactive interface to generate forecasts

Approach: Deployment-Ready R&D

- Principled validation approachesPractical, real-world performance baselinesDifferential privacy-based hold out testingDesign for rapid applicationR&D in portable computing containersRelease-ready data and models with APIs

Project Work Plan

	Year 1 S1	Year 1 S2
Data and Infrastructure Engineering	Database design and population, feature engineering	Refinement and linking
Algorithm Development	Performance metric design	Core model development
Interface Development		Static performance reports

Iteration, documentation, and reporting

Detail: SOW P. 7

Reporting and Deliverables

- Monthly status reports and cost statementsSemi-annual milestonesAnnual technical reportsSource code and project databasesPublications and conference papers

From: (b)(6)
To:
Subject: CB11030 NEW GRANT - EcoHealth Alliance ready for your review and signatures
Date: Wednesday, March 24, 2021 12:55:33 PM

(b)(6)

1. The PR package for CB11030 (New Grant) for EHA is ready for your review and signatures here:

J:\Restricted\RD\CB\1601.01 Project Mgmt\CBI\2 - Projects\1 - Active\Analytics & Data\CB11030 - EHA Predicting Biothreat Impacts\1 - Contract documents\1_FY21_New Grant

2. The following require your signature:

01 REGA

02 DURC

03 HSAU

04 FRDC

07 GOR Appointment Letter

3. (b)(6)

4. Two things I do not have that are required for the REGA include the financial POC and information, and the EHA address for sending over the funds. I did not see a cover sheet with that information and am happy to reach out to Noam, but assume you have more contact info. Let me know what you decide.

5. Lastly, our allotted BR funding is $250k, but the final cost came in at $253,279.10. We obviously can't snag the excess from the planning line because it's LFIBR. I'm working on how to ameliorate that with (b)(6)
(b)(6)
and sign all, and I will adjust the number on the REGA when we get adjudication.

Let me know if you have questions!

Thanks,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis

Defense Threat Reduction Agency

Research and Development Directorate

Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)

NIPR:

SIPR:

DTRA Monthly Project Update DRAFT

Project Number: HDTRA-121-100023

Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

Prepared By: (b)(6)

Reporting Period: August 2021

Summary of Progress

For this start-up month, we set up our workflow structures and began data design and ingest tasks. We expect project pace to increase in months 2-3 when we complete new hiring for the project.

- Setting up repositories and hosting for project code, output, and automated workflows (1.1.1)
- Testing several options for a project database structure to optimize our workflow (1.1.1)
- Building a pipeline to ingesting data from the AIDO system (1.2.2)
- Administrative: Project kick-off with DTRA, setting up of internal project management system
- Personnel: Hiring new research scientist to join team

SOW Tasks Underway

1.1.1 Layout a provision internal project network
1.2.1 Design database schema
1.2.2 Write pipelines to ingest data
1.4.1 Write and maintain initial codebase documentation

SOW Tasks Completed

None

Current Outstanding Issues, Risks and Mitigations

We are completing team hiring this month.

Cost

TBD

Email

DTRA/SCC-WMD HUMAN RESEARCH / ANIMAL USE CLEARANCE

1. PROJECT/ PROPOSAL/TRACKING NUMBER: FRBAA09-6-2-0188 / DAI Req #: 12254/CT 2014-33

2. TITLE: Understanding Rift Valley Fever in Republic of South Africa

A. Human Subject Research

Yes ☒ No ☐ ***Does the work proposed constitute human research?***

If the proposed activity is not research, or is research that does NOT involve human research subjects, check NO. If the proposed activity will involve human subjects, check YES and proceed with rest of form.

A.1 Animal Use Research

Yes ☒ No ☐ ***Does the effort involve the use of vertebrate animals at an extramural site?*** Check No if the proposed activity does not involve vertebrate animals or if the use of vertebrate animals will be limited to DoD facilities. Check YES if the proposed activity will involve use of vertebrate animals at an extramural (non-DoD) site.

PM

Dr. Mary Lancaster	Civilian	(703) 737-6625
3.PROGRAM MANAGER PRINTED NAME	4. RANK	5. PHONE
AFRICOM Regional Science Manager	LANCASTER.MARY.J.1514840713	17 Apr 2017
6. TITLE	7. SIGNATURE	8. DATE

If both boxes are checked NO, forward this document to your Directorate's financial management office/CCaR record for inclusion in the procurement/contracting folder; do not complete sections 2-5. If either box is checked YES, send the form to your Joint Directorate/Staff Office ROB representative (e-mail: dtra.belvoir.J9.mbx.research-oversight-board@mail.mil) and add it to your financial management office/CCaR record. Since ROB approval could take some time, J4-contracting is authorized to process the award as long as ROB approval is pending.

B. Research Oversight Board (ROB) Joint Directorate/Staff Office POC Review

☒ Concur ☐ Non-Concur (If NON-CONCUR return to the PM/S & T Manager).

Dr. Gavin Braunstein	Civilian	(703) 767-7788
9. ROB REPRESENTATIVE PRINTED NAME	10. RANK	11. PHONE
EUCENT Regional Science Manager	BRAUNSTEIN.GAVIN.M.1258915719	17 Apr 2017
12. TITLE	13. SIGNATURE	14. DATE

C. Joint Directorate/ Staff Office (or Designee) Review

2 LTR

☒ Concur ☐ Non-Concur (If NON-CONCUR return to POC)

Dr. Carl Newman	(703) 767-7789
15. NAME	16. PHONE
NEWMAN.CARL.I.1393072039	17 Apr 2017
17. SIGNATURE	18.DATE

D. Research Oversight Board Review

ROB

☒ Approve ☐ Disapprove

If approved sign and return to Program Manager for processing. If disapproved, return to directorate/Program Manager with requirements for approval.

Al Graziano	(703) 767-3360	Amendment #1 (4/19/17) approved by Hummingbird IRB on 4/26/17. Approved by ROB 5/2/17.
19. EXECUTIVE SECRETARY NAME	20. PHONE	
GRAZIANO.ALFRED.S.JR.1008083130	02 May 2017	
21. SIGNATURE	22. DATE	COMMENTS

Email

DTRA/SCC-WMD HUMAN RESEARCH / ANIMAL USE CLEARANCE

Human Research & Animal Use

Institutional Assurance (attach documentation from HHS website if available):

☐ DoD ASSURANCE ☒ DHHS ASSURANCE ☐ DOCUMENTATION ON FILE WITH HROB

23. ASSURANCE NUMBER: FWA00022431

24. DATE EXPIRES: 10/15/2019

Assurance Type: Single Project/Multiple Project ☐ SINGLE PROJECT ☐ MULTIPLE PROJECT

NOTE: DoD performing institutions must have DoD-granted assurances.

IRB Approval (attach documentation available)

☒ IRB has reviewed and approved the proposed RDT&E activity (attach documentation)

25. REVIEWED BY IRB ON: 4/29/17

Category of Research: Human Subjects Research: ☐ (HSR) EXEMPT ☒ HSR NOT EXEMPT

Level of Risk: ☒ Minimal Risk (MR) ☐ Greater than Minimal Risk (GMR)

Approved informed consent document (attach): ☒ Yes ☐ No

If IRB approval is PENDING:

26. INSTUTIONAL COMPLIANCE OFFICER

27. PHONE

Animal Use/Research

Attach the proposal with the Principal Investigator's information, a copy of the institution-approved animal use protocol (if available), and a completed ACURO Animal Use Appendix with associated supporting documents.

Select the appropriate box if the study involves dogs/cats, marine mammals or non-human primates.

☐ Dogs/Cats ☐ Marine Mammals ☐ Non-Human Primates

28. PLANNED EXTRAMURAL CONTRACTOR:

29. PI NAME: Dr. William Karesh, DVM 30. PHONE:

31. EMAIL: Karesh@ecohealthalliance.org 32. ANIMAL EFFORTS SUBCONTRACT? Y/N N 32a. LOCATION:

ACURO Review (attach documentation if available)

33. APPROVED BY IACUC ON Sep 1, 2015

34. REVIEWED BY ACURO ON Oct 7, 2015, Dec 9, 2016

DTRA/SCC-WMD HUMAN RESEARCH / ANIMAL USE CLEARANCE

Instructions for the DTRA/SCC-WMD Human Research / Animal Use Clearance Checklist

This checklist is to accompany all research, development, test, and evaluation (RDT&E) purchase requests forwarded to J4/8C for contracting action. Its purpose is to (1) document whether an RDT&E activity is human subjects research or extramural animal use, (2) if so, if it is compliant with applicable regulations, and (3) has been approved for funding by the Research Oversight Board (ROB) on behalf of the HSPA/AUPA.

Section A: Does the work proposed constitute human research?

As outlined in the LMS online training course titled *Human Research & Animal Use*. *Research* is defined in DoDI 3216.02 as "any systematic investigation, including (RDT&E) designed to develop or contribute to generalizable knowledge." The same reference defines research involving a human being as an experimental subject as "an activity, for research purposes, where there is an intervention or interaction with a human being for the purpose of (1) obtaining data on the effect of the intervention or interaction with the individual, or (2) identifiable private information" (32 CFR 219.102f). From the above definitions, contracts to provide goods and general services to DTRA/SCC-WMD (e.g., contracts for housekeeping, security, maintenance, utilities, office supplies, etc.) are not research. Similarly, RDT&E activities that do not involve testing of human beings or human-derived materials (for example, testing the effects of decontaminating solutions on electronic equipment) are not human subjects research and are not subject to the requirements of 32 CFR 219, DoDI 3216.02 or DTRA/SCC-WMD Directive 3216.01. ***Checking NO in this section means that no further review is required,*** and J4/8C will process the acquisition action.

Section A1: Does the effort involve the use of vertebrate animals at an extramural site?

If this research study plans to use a living vertebrate animal, including birds, cold-blooded animals, rats of the genus *Rattus* and mice of the genus *Mus*, birds, fish or amphibians in a DTRA/SCC-WMD funded effort at a non-DoD location, then answer YES to this question. Studies performed at DoD locations (e.g. USAMRIID, USAMRICD) are exempt from DTRA/SCC-WMD oversight since all DoD locations have active animal use oversight programs.

Section B: Research Oversight Board JDIR/Directorate POC Review

Each JDIR has a representative on the DTRA/SCC-WMD Research Oversight Board. Submit this checklist, proposal, and other supporting documentation to your Directorate/directorate representative and e-mail it to the ROB at dtra.belvoir.J9.mbx.research-oversight-board@mail.mil. Your ROB representative will review the request and assist you in obtaining approval for submission to the Research Oversight Board.

DTRA/SCC-WMD HUMAN RESEARCH / ANIMAL USE CLEARANCE

Section C: Directorate Review

- CONCUR if Directorate or designee agrees with PM/STM/GOR/COR assessment to forward package to ROB for DTRA/SCC-WMD administrative review.

- NON-CONCUR if Directorate or designee has determined that compliance issues must be addressed before the package may be forwarded to the ROB. If NON-CONCUR, attach basis for non-concurrence and return to PM.

Section D: ROB Review

- CONCUR if Executive Secretary of the ROB agrees with PM assessment. HSPA/AUPA has delegated approval authority to the Executive Secretary of the ROB.
- NON-CONCUR if Executive Secretary of the ROB has determined that compliance issues must be addressed before the package can be approved for expenditure of DTRA/SCC-WMD funds. If NON-CONCUR, attach basis for non-concurrence and return to Directorate.

HSPA/AUPA Review/Approval

- The HSPA/AUPA has delegated approval authority to the Executive Secretary of the ROB. Accordingly, Senior Financial Officers and contracting personnel will accept ROB concurrence and signature as authority to process the acquisition order and release/transfer funds.

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

A. PROJECT INFORMATION

PROJECT / PROPOSAL / TRACKING NUMBER: FRBAA14-6-2-0333/HDTRA1-19-1-0033/ CT 2019-41

TITLE: Reducing the Threat of Rift Valley Fever through Ecology, Epidemiology and Socio Economics

OTHER TRANSACTION AUTHORITY (OTA): YES ☐ NO ☒

A.1. HUMAN SUBJECT RESEARCH

YES ☒ NO ☐ *DOES THE WORK PROPOSED CONSTITUTE HUMAN RESEARCH?*

NAME OF INSTITUTION(S) PERFORMING WORK: EcoHealth Alliance

A.2. ANIMAL USE RESEARCH

YES ☒ NO ☐ *DOES THE EFFORT INVOLVE THE USE OF VERTEBRATE ANIMALS AT AN EXTRAMURAL SITE?*

YES ☐ NO ☒ *DOES THE EFFORT INVOLVE THE USE OF VERTEBRATE ANIMALS AT AN INTRAMURAL SITE?*

NAME OF INSTITUTION(S) PERFORMING WORK: EcoHealth Alliance

PM/STM- PRINTED NAME: (b)(6) GRADE/RANK: Civilian PHONE: (b)(6)

TITLE: AFRICOM Science Manager SIGNATURE: (b)(6) DATE:

B. RESEARCH OVERSIGHT BOARD REVIEW

ROB REPRESENTATIVE - PRINTED NAME: (b)(6) GRADE/RANK: Civilian PHONE: (b)(6)

TITLE: EUCENT Science Manager SIGNATURE: (b)(6) DATE: Mar 29, 2019

C. DIRECTORATE REVIEW

DIRECTORATE REPRESENTATIVE - PRINTED NAME: (b)(6) GRADE/RANK: Civilian PHONE: (b)(6)

TITLE: BTRP Science Division Chief SIGNATURE: (b)(6) DATE: Jan 14, 2020

D. RESEARCH OVERSIGHT BOARD EXECUTIVE SECRETARY REVIEW

ROB EXECUTIVE SECRETARY - PRINTED NAME: (b)(6) GRADE/RANK: GS-14 PHONE: (b)(6)

TITLE: ROB ES SIGNATURE: (b)(6) DATE: Mar 31, 2020

E. ANNUAL CERTIFICATION / CONTINUING REVIEW OF HUMAN RESEARCH AND/OR ANIMAL USE

I have reviewed the subject project and certify that the cognizant institutional review board (IRB) or Institutional Animal Care and Use Committee (IACUC) has conducted the required periodic review and continues to approve this research, as required by federal regulations.

PM/STM- PRINTED NAME: GRADE/RANK: PHONE:

TITLE: SIGNATURE: DATE:

ROB EXECUTIVE SECRETARY - PRINTED NAME: GRADE/RANK: PHONE:

TITLE: SIGNATURE: DATE:

PM/STM- PRINTED NAME: GRADE/RANK: PHONE:

TITLE: SIGNATURE: DATE:

ROB EXECUTIVE SECRETARY - PRINTED NAME: GRADE/RANK: PHONE:

TITLE: SIGNATURE: DATE:

CLICK HERE IF ADDITIONAL PM/STM AND ROB EXECUTIVE SECRETARY REVIEW AND CERTIFICATION IS NEEDED

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

HUMAN SUBJECT RESEARCH: (***SEE ATTACHED HRPO APPROVAL***)

Research involving human subjects is PENDING. No work involving human subjects may begin until approved - 31 March 2020

ANIMAL USE/RESEARCH: (***SEE ATTACHED ACURO APPROVAL***)

Email

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

1. PROJECT/ PROPOSAL/TRACKING NUMBER: FRBAA14-6-2-0050/CT 2018-17

2. TITLE: Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses... in Peninsular Malaysia

PM

A. Human Subject Research

Yes	No	
☒	☐	***Does the work proposed constitute human research?*** If the proposed activity is not research, or is research that does NOT involve human research subjects, check NO. If the proposed activity will involve human subjects, check YES and proceed with rest of form.

A.1 Animal Use Research

Yes	No	
☒	☐	***Does the effort involve the use of vertebrate animals at an extramural site?*** Check No if the proposed activity does not involve vertebrate animals or if the use of vertebrate animals will be limited to DoD facilities. Check YES if the proposed activity will involve use of vertebrate animals at an extramural (non-DoD) site.

(b)(6)	E	GS-13	(b)(6)
3.PROGRAM MANAGER PRINTED NAME		4. RANK	5. PHONE

PACOM Regional Science Manager	(b)(6)	05 Jul 2018
6. TITLE	7. SIGNATURE	8. DATE

If both boxes are checked NO, forward this document to your Directorate's financial management office for inclusion in the procurement/contracting folder; do not complete sections 2-5.. If either box is checked YES, send the form to your Directorate/Staff Office ROB representative (e-mail: dtra.belvoir.rd.mbx.research-oversight-board@mail.mil) and add it to your financial management office record. Since ROB approval could take some time, the Contracts Department (AL-AC) is authorized to process the award as long as ROB approval is pending.

B. Research Oversight Board (ROB) Directorate/Staff Office POC Review

☒ Concur ☐ Non-Concur (If NON-CONCUR return to the PM/S & T Manager).

(b)(6)	GS-13	
9. ROB REPRESENTATIVE PRINTED NAME	10. RANK	11. PHONE

EUCENT Science Manager	(b)(6)	10 Jul 2018
12. TITLE	13. SIGNATURE	14. DATE

C. Directorate/ Staff Office (or Designee) Review

2 LTR

☒ Concur ☐ Non-Concur (If NON-CONCUR return to POC)

(b)(6)	(b)(6)
15. NAME	16. PHONE
(b)(6)	11 Jul 2018
17. SIGNATURE	18.DATE

D. Research Oversight Board Review

ROB

☐ Approve ☐ Disapprove

If approved sign and return to Program Manager for processing. If disapproved, return to directorate/Program Manager with requirements for approval.

(b)(6)	(b)(6)	Pending HRPO and ACURO approvals since 9/17/2018.
19. EXECUTIVE SECRETARY NAME	20. PHONE	
(b)(6)	05 Mar 2019	
21. SIGNATURE	22. DATE	COMMENTS

Email

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

Human Research

Institutional Assurance (attach documentation from HHS website if available):

☐ DoD ASSURANCE ☐ DHHS ASSURANCE ☐ DOCUMENTATION ON FILE WITH ROB

23. ASSURANCE NUMBER: _____

24. DATE EXPIRES: _____

Assurance Type: Single Project/Multiple Project ☐ SINGLE PROJECT ☐ MULTIPLE PROJECT

NOTE: DoD performing institutions must have DoD-granted assurances.

IRB Approval (attach documentation available)

☐ IRB has reviewed and approved the proposed RDT&E activity (attach documentation)

25. REVIEWED BY IRB ON: _____

Category of Research: Human Subjects Research: ☐ (HSR) EXEMPT ☐ HSR NOT EXEMPT

Level of Risk: ☐ Minimal Risk (MR) ☐ Greater than Minimal Risk (GMR)

Approved informed consent document (attach): ☐ Yes ☐ No

DTRA CIP Reviewer:

_____ _____

26. DTRA HUMAN RESEARCH COMPLIANCE OFFICER (name, e-mail address, date of review) 27. PHONE

Animal Use/Research

Attach the proposal with the Principal Investigator's information, a copy of the institution-approved animal use protocol (if available), and a completed ACURO Animal Use Appendix with associated supporting documents.

Select the appropriate box if the study involves dogs/cats, marine mammals or non-human primates.

☒ Dogs/Cats ☐ Marine Mammals ☒ Non-Human Primates

28. PLANNED EXTRAMURAL CONTRACTOR: _____

29. PI NAME: Jonathan Epstein 30. PHONE: (212) 380-4467

31. EMAIL: epstein@ecohealthalliance.org 32. ANIMAL EFFORTS SUBCONTRACT? Y/N Y 32a. LOCATION: _____

ACURO Review (attach documentation if available)

33. APPROVED BY IACUC ON _____

34. REVIEWED BY ACURO ON _____

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

Instructions for the DTRA Human Research / Animal Use Clearance Checklist

This checklist is to accompany all research, development, test, and evaluation (RDT&E) purchase requests forwarded to the Acquisition, Finance, and Logistics Directorate (AL) for contracting action. Its purpose is to (1) document whether an RDT&E activity is human subjects research or extramural animal use, (2) if so, if it is compliant with applicable regulations, and (3) has been approved for funding by the Research Oversight Board (ROB) on behalf of the HSPA/AUPA.

Section A: Does the work proposed constitute human research?

As outlined in the LMS online training course titled *Human Research & Animal Use*. *Research* is defined in DoDI 3216.02 as "any systematic investigation, including (RDT&E) designed to develop or contribute to generalizable knowledge." The same reference defines research involving a human being as an experimental subject as "an activity, for research purposes, where there is an intervention or interaction with a human being for the purpose of (1) obtaining data on the effect of the intervention or interaction with the individual, or (2) identifiable private information" (32 CFR 219.102f). From the above definitions, contracts to provide goods and general services to DTRA (e.g., contracts for housekeeping, security, maintenance, utilities, office supplies, etc.) are not research. Similarly, RDT&E activities that do not involve testing of human beings or human-derived materials (for example, testing the effects of decontaminating solutions on electronic equipment) are not human subjects research and are not subject to the requirements of 32 CFR 219, DoDI 3216.02 or DTRA Directive 3216.01. ***Checking NO in this section means that no further review is required,*** and the AL Directorate will process the acquisition action.

Section A1: Does the effort involve the use of vertebrate animals at an extramural site?

If this research study plans to use a living vertebrate animal, including birds, cold-blooded animals, rats of the genus *Rattus* and mice of the genus *Mus*, birds, fish or amphibians in a DTRA funded effort at a non-DoD location, then answer YES to this question. Studies performed at DoD locations (e.g. USAMRIID, USAMRICD) are exempt from DTRA oversight since all DoD locations have active animal use oversight programs.

Section B: Research Oversight Board (ROB)/Directorate/Staff Office/POC Review

Each Directorate has a representative on the DTRA Research Oversight Board. Submit this checklist, proposal, and other supporting documentation to your Directorate/directorate representative and e-mail it to the ROB at dtra.belvoir.rd.mbx.research-oversight-board@mail.mil. Your ROB representative will review the request and assist you in obtaining approval for submission to the Research Oversight Board.

DTRA HUMAN RESEARCH / ANIMAL USE CLEARANCE

Section C: Directorate Review

- CONCUR if Directorate or designee agrees with PM/STM/GOR/COR assessment to forward package to ROB for DTRA administrative review.

- NON-CONCUR if Directorate or designee has determined that compliance issues must be addressed before the package may be forwarded to the ROB. If NON-CONCUR, attach basis for non-concurrence and return to PM.

Section D: ROB Review

- CONCUR if Executive Secretary of the ROB agrees with PM assessment. HSPA/AUPA has delegated approval authority to the Executive Secretary of the ROB.
- NON-CONCUR if Executive Secretary of the ROB has determined that compliance issues must be addressed before the package can be approved for expenditure of DTRA funds. If NON-CONCUR, attach basis for non-concurrence and return to Directorate.

HSPA/AUPA Review/Approval

- The HSPA/AUPA has delegated approval authority to the Executive Secretary of the ROB. Accordingly, Senior Financial Officers and contracting personnel will accept ROB concurrence and signature as authority to process the acquisition order and release/transfer funds.

REPORT OF INVENTIONS AND SUBCONTRACTS

(Pursuant to "Patent Rights" Contract Clause) (See Instructions on back)

Form Approved
OMB No. 3000-0095
Expires Jan 31, 2008

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION. RETURN COMPLETED FORM TO THE CONTRACTING OFFICER.

1.a. NAME OF CONTRACTOR/SUBCONTRACTOR	c. CONTRACT NUMBER	2.a. NAME OF GOVERNMENT PRIME CONTRACTOR	c. CONTRACT NUMBER	3. TYPE OF REPORT (X one)
Clango, Inc	GRITS-DIT-FY16-1	EcoHealth Alliance	HDTRA1-15-0041	a. INTERIM [X] b. FINAL
b. ADDRESS (Include ZIP Code) 2107 Wilson Blvd Suite 100 Arlington, VA 22201	d. AWARD DATE (YYYYMMDD) 20160501	b. ADDRESS (Include ZIP Code) 460 West 34th street, 17th floor New York, NY 10001	d. AWARD DATE (YYYYMMDD) 20150409	4. REPORTING PERIOD (YYYYMMDD) a. FROM 20150409 b. TO 20170930

SECTION I - SUBJECT INVENTIONS

5. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR (If "None," so state)

NAME(S) OF INVENTOR(S) (Last, First, Middle Initial) a.	TITLE OF INVENTION(S) b.	DISCLOSURE NUMBER, PATENT APPLICATION SERIAL NUMBER OR PATENT NUMBER c.	ELECTION TO FILE PATENT APPLICATIONS (X) d.				CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER (X) e.	
			(1) UNITED STATES		(2) FOREIGN			
			(a) YES	(b) NO	(a) YES	(b) NO	(a) YES	(b) NO
Matta, Stpehen Yodder, James	Global Rapid Identification Tool Set (GRITS)			X		X		X
Matta, Stpehen Yodder, James	Flight Risk Tracker (FLIRT)			X		X		X
Matta, Stpehen Yodder, James	EIDR Connect			X		X		X

f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR		g. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED	
(1) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(2) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(1) TITLE OF INVENTION	(2) FOREIGN COUNTRIES OF PATENT APPLICATION
(b) NAME OF EMPLOYER	(b) NAME OF EMPLOYER		
(c) ADDRESS OF EMPLOYER (Include ZIP Code)	(c) ADDRESS OF EMPLOYER (Include ZIP Code)		

SECTION II - SUBCONTRACTS (Containing a "Patent Rights" clause)

6. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR (If "None," so state)

NAME OF SUBCONTRACTOR(S) a.	ADDRESS (Include ZIP Code) b.	SUBCONTRACT NUMBER(S) c.	FAR "PATENT RIGHTS" d.		DESCRIPTION OF WORK TO BE PERFORMED UNDER SUBCONTRACT(S) e.	SUBCONTRACT DATES (YYYYMMDD) f.	
			(1) CLAUSE NUMBER	(2) DATE (YYYYMM)		(1) AWARD	(2) ESTIMATED COMPLETION

SECTION III - CERTIFICATION

7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR (Not required if: (X as appropriate)) [ ] SMALL BUSINESS or [ ] NONPROFIT ORGANIZATION

I certify that the reporting party has procedures for prompt identification and timely disclosure of "Subject Inventions," that such procedures have been followed and that all "Subject Inventions" have been reported.

a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL (Last, First, Middle Initial)	b. TITLE	c. SIGNATURE	d. DATE SIGNED
McGeehan, Patrick	VP of Service Delivery		20180216

DTRA HUMAN SUBJECTS / ANIMAL USE RESEARCH CLEARANCE

A. PROJECT INFORMATION

PROJECT NUMBER: FRBAA14-6-2-0356 / CT00001

TITLE: A One Health Approach to Understanding the Epidemiology of Crimean-Congo Hemorrhagic Fever Virus in Tanzania

PRIME CONTRACTOR: EcoHealth Alliance

YES ☐ NO ☒ OTHER TRANSACTION AUTHORITY (OTA):

A.1. RESEARCH INVOLVING HUMAN SUBJECTS (INCLUDING HUMAN ANATOMICAL SUBSTANCES (HAS))

YES ☒ NO ☐ *DOES THE WORK PROPOSED CONSTITUTE RESEARCH INVOLVING HUMAN SUBJECTS AND/OR HUMAN ANATOMICAL SUBSTANCES?*

NAME OF INSTITUTION(S) PERFORMING THE WORK (INCLUDING PRIME AND SUBS(S)):

EcoHealth Alliance

A.2. RESEARCH INVOLVING ANIMAL USE

YES ☒ NO ☐ *DOES THE WORK PROPOSED INVOLVE THE USE OF VERTEBRATE ANIMALS AT AN EXTRAMURAL SITE?*

YES ☐ NO ☒ *DOES THE WORK PROPOSED INVOLVE THE USE OF VERTEBRATE ANIMALS AT AN INTRAMURAL SITE?*

NAME OF INSTITUTION(S) PERFORMING THE WORK (INCLUDING PRIME AND SUBS(S)):

EcoHealth Alliance

PM / STM NAME: (b)(6) SIGNATURE: (b)(6)

B. RESEARCH OVERSIGHT BOARD (ROB) REGISTRATION

ROB REPRESENTATIVE NAME: (b)(6) SIGNATURE: (b)(6)

☐ NO ROB OVERSIGHT (SEE PAGE 2 FOR DETAILS)

C. ROB EXECUTIVE SECRETARY (ES) / PROGRAM MANAGER (PM) APPROVAL

☒ APPROVED FOR RESEARCH INVOLVING HUMAN SUBJECTS

ROB ES / PM NAME: (b)(6) SIGNATURE: (b)(6)

☒ APPROVED FOR RESEARCH INVOLVING ANIMAL USE

ROB ES / PM NAME: (b)(6) SIGNATURE: (b)(6)

D. ANNUAL CERTIFICATION / CONTINUING REVIEW OF HUMAN SUBJECTS AND/OR ANIMAL USE RESEARCH

I have reviewed the subject project and certify that the cognizant Institutional Review Board (IRB) or Institutional Animal Care and Use Committee (IACUC) has conducted the required periodic review and continues to approve this research, as required by Federal Regulations.

PM / STM NAME: SIGNATURE:

ROB ES / PM NAME: SIGNATURE:

PM / STM NAME: SIGNATURE:

ROB ES / PM NAME: SIGNATURE:

CLICK HERE IF ADDITIONAL ANNUAL CERTIFICATION / CONTINUING REVIEW IS NEEDED

DTRA HUMAN SUBJECTS / ANIMAL USE RESEARCH CLEARANCE

RESEARCH INVOLVING HUMAN SUBJECTS:

(10/15/21) HRPO Log Numbers E02803.1a (EHA), E02803.1b (WSU), and E02803.1e (PHEL) HRPO Approval Memorandum. Human Research Protections Office (HRPO) reviewed the protocol and found it complies with applicable DOD, U.S. Army, and USAMRDC human subjects protection requirements. This no greater than minimal risk study is approved for the enrollment of 1586 subjects in Northern Tanzania for this study. This protocol is a multi-institution collaborative surveillance study conducted in rural Tanzania in search for evidence of Crimean-Congo Hemorrhagic Fever.

RESEARCH INVOLVING ANIMAL USE:

(03/18/21) ACURO has completed the review of Tuft's Medical Center protocol # G2020-43, entitled, "Crimean-Congo Hemorrhagic Fever: Reducing an Emerging Health Threat in Tanzania," supporting DTRA proposal CT00001, award # HDTRA1-20-1-0018, and this protocol is approved for the use of animals as of 18 March 2021.

From: (b)(6)
To: (b)(6) (b)(6)
Subject: EcoHealth Alliance Grant Kick Off
Start: Tuesday, August 17, 2021 10:00:00 AM
End: Tuesday, August 17, 2021 11:00:00 AM
Location: Virtual (TBD)

All,

This grant kick off meeting is an opportunity for our team to review the proposed approach and deliverables for the base period tasks as outlined in the SOW, discuss programmatic expectations (reporting requirements, deliverables), and address any outstanding issues/questions prior to initiating the R&D effort (See draft agenda below).

1000-1030: EcoHealth Alliance Briefing (PPT format is preferred)

1030-1100: Open Discussion (All)

Please forward to any other team members you would like in attendance for this initial meeting.

We look forward to officially starting this effort!

Thanks,

(b)(6)

Science and Technology Manager

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

NIPR (b)(6)

SIPR

REPORT OF INVENTIONS AND SUBCONTRACTS

(Pursuant to "Patent Rights" Contract Clause) (See Instructions on back)

Form Approved
OMB No. 9000-0095
Expires Jan 31, 2008

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION. RETURN COMPLETED FORM TO THE CONTRACTING OFFICER.

1.a. NAME OF CONTRACTOR/SUBCONTRACTOR	c. CONTRACT NUMBER	2.a. NAME OF GOVERNMENT PRIME CONTRACTOR	c. CONTRACT NUMBER	3. TYPE OF REPORT (X one)
EcoHealth Alliance	HDTRA1-15-C-0041	EcoHealth Alliance	HDTRA1-15-0041	a. INTERIM [X] b. FINAL

b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	4. REPORTING PERIOD (YYYYMMDD)
460 West 34th street, 17th floor New York, NY 10001	20150409	460 West 34th street, 17th floor New York, NY 10001	20150409	a. FROM 20150409 b. TO 20170930

SECTION I - SUBJECT INVENTIONS

5. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME(S) OF INVENTOR(S) (Last, First, Middle Initial) a.	TITLE OF INVENTION(S) b.	DISCLOSURE NUMBER, PATENT APPLICATION SERIAL NUMBER OR PATENT NUMBER c.	ELECTION TO FILE PATENT APPLICATIONS (X) d.				CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER (X) e.	
			(1) UNITED STATES		(2) FOREIGN			
			(a) YES	(b) NO	(a) YES	(b) NO	(a) YES	(b) NO
Huff, Andrew; Slagle, Amy; Horton, Russell; Breit, Nathan; Preston, Nico; Allen, T	Global Rapid Identification Tool Set (GRITS)			X		X		X
Allen, Toph; Arnold, Brock; Breit, Nathan; Whiting, Karissa; Huff, Andrew	Flight Risk Tracker (FLIRT)			X		X		X
Allen, Toph; Arnold, Brock; Breit, Nathan; Whiting, Karissa	EIDR Connect			X		X		X

f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR		g. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED	
(1) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(2) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(1) TITLE OF INVENTION	(2) FOREIGN COUNTRIES OF PATENT APPLICATION
(b) NAME OF EMPLOYER	(b) NAME OF EMPLOYER		
(c) ADDRESS OF EMPLOYER (Include ZIP Code)	(c) ADDRESS OF EMPLOYER (Include ZIP Code)		

SECTION II - SUBCONTRACTS *(Containing a "Patent Rights" clause)*

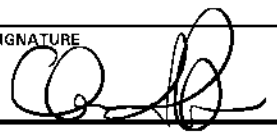
6. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME OF SUBCONTRACTOR(S) a.	ADDRESS (Include ZIP Code) b.	SUBCONTRACT NUMBER(S) c.	FAR "PATENT RIGHTS" d.		DESCRIPTION OF WORK TO BE PERFORMED UNDER SUBCONTRACT(S) e.	SUBCONTRACT DATES (YYYYMMDD) f.	
			(1) CLAUSE NUMBER	(2) DATE (YYYYMM)		(1) AWARD	(2) ESTIMATED COMPLETION
ProMED	9 Babcock St, Brookline, MA 02446	GRITS-ISID-FY16-1	52.227-11	200712	Consultation, provided epidemiological data, application testing	20160409	20170930
Distributed Information Technologies, Inc	2107 Wilson Boulevard, Suite 100, Arlington, VA, 22201	GRITS-DIT-FY16-1	52.227-11	200712	Contributions to application code base	20160501	20170101

SECTION III - CERTIFICATION

7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR *(Not required if: (X as appropriate))* [ ] SMALL BUSINESS or [X] NONPROFIT ORGANIZATION

I certify that the reporting party has procedures for prompt identification and timely disclosure of "Subject Inventions," that such procedures have been followed and that all "Subject Inventions" have been reported.

a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL (Last, First, Middle Initial)	b. TITLE	c. SIGNATURE	d. DATE SIGNED
Allen, Christopher G (d.b.a. Allen, Toph)	Director of Data Science		20180216

DD FORM 882, JUL 2005 PREVIOUS EDITION IS OBSOLETE. Reset FormFlow/Adobe Professional 6.0

DD FORM 882 INSTRUCTIONS

GENERAL

This form is for use in submitting INTERIM and FINAL invention reports to the Contracting Officer and for use in reporting the award of subcontracts containing a "Patent Rights" clause. If the form does not afford sufficient space, multiple forms may be used or plain sheets of paper with proper identification of information by item number may be attached.

An INTERIM report is due at least every 12 months from the date of contract award and shall include (a) a listing of "Subject Inventions" during the reporting period, (b) a certification of compliance with required invention identification and disclosure procedures together with a certification of reporting of all "Subject Inventions," and (c) any required information not previously reported on subcontracts containing a "Patent Rights" clause.

A FINAL report is due within 6 months if contractor is a small business firm or domestic nonprofit organization and within 3 months for all others after completion of the contract work and shall include (a) a listing of all "Subject Inventions" required by the contract to be reported, and (b) any required information not previously reported on subcontracts awarded during the course of or under the contract and containing a "Patent Rights" clause.

While the form may be used for simultaneously reporting inventions and subcontracts, it may also be used for reporting, promptly after award, subcontracts containing a "Patent Rights" clause.

Dates shall be entered where indicated in certain items on this form and shall be entered in six or eight digit numbers in the order of year and month (YYYYMM) or year, month and day (YYYYMMDD). Example: April 2005 should be entered as 200504 and April 15, 2005 should be entered as 20050415.

1.a. Self-explanatory.

1.b. Self-explanatory.

1.c. If "same" as Item 2.c., so state.

1.d. Self-explanatory.

2.a. If "same" as Item 1.a., so state.

2.b. Self-explanatory.

2.c. Procurement Instrument Identification (PII) number of contract (DFARS 204.7003).

2.d. through 5.e. Self-explanatory.

5.f. The name and address of the employer of each inventor not employed by the contractor or subcontractor is needed because the Government's rights in a reported invention may not be determined solely by the terms of the "Patent Rights" clause in the contract.

Example 1: If an invention is made by a Government employee assigned to work with a contractor, the Government rights in such an invention will be determined under Executive Order 10096.

Example 2: If an invention is made under a contract by joint inventors and one of the inventors is a Government employee, the Government's rights in such an inventor's interest in the invention will also be determined under Executive Order 10096, except where the contractor is a small business or nonprofit organization, in which case the provisions of 35 U.S.C. 202(e) will apply.

5.g.(1) Self-explanatory.

5.g.(2) Self-explanatory with the exception that the contractor or subcontractor shall indicate, if known at the time of this report, whether applications will be filed under either the Patent Cooperation Treaty (PCT) or the European Patent Convention (EPC). If such is known, the letters PCT or EPC shall be entered after each listed country.

6.a. Self-explanatory.

6.b. Self-explanatory.

6.c. Self-explanatory.

6.d. Patent Rights Clauses are located in FAR 52.227.

6.e. Self-explanatory.

6.f. Self-explanatory.

7. Certification not required by small business firms and domestic nonprofit organizations.

7.a. through 7.d. Self-explanatory.

Attachment 1 - Statement of Work (SOW)
Project Title: Predictin Biothreat Impacts from Early-Stage Data via Transfer Learning
Document Date: February 26, 2021

Objective
The project's objectives are to determine the efficacy of machine learning (ML) techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats, both intentional (e.g. novel genetically-modified pathogens) and natural (e.g. zoonotic). We define "early stage" as the initial period in an outbreak when only short time-series data are available, prior to rapid growth and geographic spread, and epidemiological parameters are not well-established. Specifically, we will answer three questions that will enable rapid decision-making based on ML models of epidemic impacts:

Q1: How much does partial-pooling improve predictions of epidemic impacts, and what information transfers best across diseases?
Q2: What variables are most predictive of epidemic impacts at early stages of an outbreak?
Q3: At what point in epidemic growth do hybrid models that incorporate mechanistic epidemiological components become more accurate than pure ML models?

This work will contribute to fundamental knowledge of properties and variables that contribute most to predictive accuracy at early-stage stages in emerging outbreak prediction and forecasting. It will enable the development of robust and deployable predictive models at early stages of outbreaks, and support informed choices for data collection and model selection.

Scope
The awardee proposes a two-year study to determine the efficacy of ML techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats. The awardee team shall focus on the following major goals and milestones:

- *Year 1, Milestone 1 (0-6 months)*: Create and curate predictor database, project infrastructure, continuous integration/validation, establish data-imputation and automatic predictor workflow (Tasks 1.1-1.2).
- *Year 1, Milestone 2 (6-12 months)*: Bayesian additive regression tree (BART) model fitting and tuning, determination of variable contribution to prediction accuracy (Task 1.3). Document and validate project code and infrastructure (Task 1.4)
- *Option Year 1, Milestone 3 (12-18 months)*: Extend the database to include additional predictors, extend the BART model to ingest genetic data (Tasks 2.1-2.3)
- *Option Year, Milestone 4 (18-24 months):* Construction of hybrid ML/mechanistic model structure, comparative testing of pure and hybrid version, determination of timing when current data overtakes transfer data (Task 2.4). Document and validate project code and infrastructure (Task 2.5)
- *Option Task 1, (12-18 months):* Develop a graphical user interface (GUI) for the model, allowing users to input of early-stage outbreak data and generate predictions, uncertainty bounds, and interpretable explanations of influential variables. Document GUI and validate code.

Background

Situational awareness and risk assessment are critical at early stages of disease outbreaks, when interventions can best mitigate adverse outcomes. Yet decision-makers often face a paucity of data at these stages. Traditional modeling methods to forecast disease impact severity rely heavily on prior knowledge or assumptions about mechanisms of disease spread progression, and they frequently do not anticipate the actual mechanisms.[1-3] They also take considerable time and effort to develop.

Recent theory suggests disease dynamics are fundamentally predictable[4], and ML methods have been successfully applied in emerging disease science. ML refers to a group of methods, ranging from simple nearest-neighbor approaches to function-approximation methods such as boosted trees and penalized splines, to complex deep-learning neural networks. ML has been used to predict the likelihood of disease emergence and the zoonotic potential of various hosts and viruses[5,6], and deep-learning approaches have been used to infer viral hosts from the comparatively richer data of genetic sequences of viruses.[7,8]

ML methods are generally unstructured, flexible, and offer greater predictive power over traditional statistical approaches. However, these methods are data-intensive, and a key challenge with ML development is data paucity and/or a low signal-to-noise ratio. Surveillance data for even existing, well-studied diseases is rarely rich enough for the data scale of many modern ML techniques. For instance, a ML approach to predict impacts from a new outbreak of Ebola would draw training data from fewer than twenty previous events, each with varying levels of data coverage.

Transfer learning, or data fusion, provides a solution to data paucity issues by using data from other domains to train parts of models that are general, thus limiting new data requirements for more specific components. Hierarchical modeling, or *partial pooling*, is a transfer learning approach for partitioning out which data can be shared between models and which are only applicable to a specific case. For instance, Ebola forecasts for countries outside the historic range of the disease may be improved by calibrating against Cholera outbreaks, which have occurred both within and outside countries with Ebola outbreaks. The degree to which the disease outcomes are correlated is learned, rather than assumed.

An alternative recent development in disease forecasting is the development of hybrid models that incorporate simple mechanistic structures and predictive ML methods to learn model parameters. These approaches have demonstrated high predictive accuracy for near-term forecasting of epidemic growth and impact, particularly during the COVID-19 pandemic[9]. However, these approaches require adequate time-series of data to project forward from current conditions. Their utility in early stages and long-term forecasting accuracy has yet to be determined. In opting to apply these models, it is critical to understand these data requirements and at what point in an outbreak hybrid approaches can overtake pure ML early-stage predictions in accuracy. This project seeks to develop, apply, and compare pure and hybrid-ML techniques to enable the development of robust, rapidly usable predictions at early stages of outbreaks.

Key references (additional references can be found in the Technical Proposal):

1 MacDiarmid, S. C. *et al. Handbook On Import Risk Analysis for animals and animal products: quantitative risk assessment.* Vol. 2 (Office International des Épizooties, 2004).

2 Moura, J. A., McManus, C. M., Bernal, F. E. M. & de Melo, C. B. An analysis of the 1978 African swine fever outbreak in Brazil and its eradication. *Rev. Sci. Tech.* **29**, 549-563, doi:10.20506/rst.29.3.1992 (2010).
3 Delgado, J. *et al.* U.K. Foot and Mouth Disease: A Systemic Risk Assessment of Existing Controls. *Risk Anal.* **37**, 1768-1782, doi:10.1111/risa.12704 (2017).
4 Scarpino, S. V. & Petri, G. On the predictability of infectious disease outbreaks. *Nat. Commun.* **10**, 898, doi:10.1038/s41467-019-08616-0 (2019).
5 Olival, K. J. *et al.* Host and viral traits predict zoonotic spillover from mammals. *Nature*, doi:10.1038/nature22975 (2017).
6 Allen, T. *et al.* Global hotspots and correlates of emerging zoonotic diseases. *Nat. Commun.* **8**, 1124, doi:10.1038/s41467-017-00923-8 (2017).
7 Mock, F., Viehweger, A., Barth, E. & Marz, M. VIDHOP, viral host prediction with Deep Learning. *Bioinformatics* (2019).
8 Babayan, S. A., Orton, R. J. & Streicker, D. G. Predicting reservoir hosts and arthropod vectors from evolutionary signatures in RNA virus genomes. *Science* **362**, 577-580, doi:10.1126/science.aap9072 (2018).
9 Gu, Y. *COVID-19 Projections Using Machine Learning*, <https://covid19-projections.com/about/#historical-performance> (2020).

Data Sources
Fitting and testing models will draw from disease outbreak data (counts, timing, and geography) and predictor data including pathogen traits (disease symptoms, pathogen traits, modes of transmission), pathogen sources (point of origin, geographic range of potential natural hosts), environmental context (climatic conditions, ecosystem traits), and socioeconomic context (local population densities, demographics, transportation networks, healthcare systems). Please see the Technical Proposal for available data sources.

Tasks/Scientific Goals (Format: Year.Task.Subtask)

YEAR 1

Task 1.1 – Develop and deploy project infrastructure

The awardee shall develop a computational environment that enables continuous model development and testing and allows for research and models to be reproduced and extended by external teams. The computational environment will include continuous maintenance and documentation of project codebase.

Subtasks

1.1.1 Layout a provision internal project network
1.1.2 Set up continuous integration pipelines
1.1.3 Implement backup and data verification jobs
1.1.4 Implement differential privacy testing

Task 1.2 – Engineer project database

The awardee shall curate, integrate, cross-link, and validate relevant datasets from various sources into a project database, accounting for differing space and time scales, data formats, and data completeness.

Subtasks

1.2.1 Design database schema
1.2.2 Write pipelines to ingest data
1.2.3 Cross-link data sources via common ontology

1.2.4 Write quality assurance/quality control (QA/QC) tests for data and perform data cleaning
1.2.5 Create automatic extraction routines to populate relevant predictors from location information
1.2.6 Update data from live sources and clean and maintain data continuously

Task 1.3 – Machine Learning (ML) model development and testing
The awardee shall design, implement, test, and analyze performance of ML model structures and iteratively improve them.

Subtasks
1.3.1 Establish quantitative and qualitative metrics of model performance
1.3.2 Implement "practical naïve" model baseline
1.3.3 Design Bayesian additive regression tree (BART) model structure
1.3.4 Design alternative generalized additive model (GAM) structure
1.3.5 Implement within-disease, all-disease, and partial-pooled disease model versions
1.3.6 Measure variable contribution by re-fitting
1.3.7 Analyze prediction-level variable contributions and model performance
1.3.8 Iteratively update models to improve performance

Task 1.4 – Maintain and document project infrastructure
The awardee shall document the methodology for database schema, data ingestion pipelines, QA/QC tests, extraction routes, and ML models established in Tasks 1.1-1.3.
Subtasks
1.4.1 Write and maintain initial codebase documentation
1.4.2 Perform code review, testing, and validation

OPTION YEAR (OPTION I):

Task 2.1 – Extend project database
In the option year, the awardee shall extend the database to include additional predictors and continuously maintain and update to accumulate more data from upstream sources.

Subtasks
2.1.1 Extend database schema to include genetic data and auto-encoded variables
2.1.2 Write pipelines to ingest genetic data
2.1.3 Cross-link data sources via common ontologies
2.1.4Write QA/QC tests for data and perform data cleaning
2.1.5Update data from live sources and clean and maintain data continuously

Task 2.2 – Extend BART model
In the option year, the awardee shall extend the BART model to ingest genetic data and test the contribution of this data in enhancing or recapitulating pathogen trait data.

Subtasks
2.2.1Develop genetic predictor variable set via neural-network autoencoding
2.2.2 Modify BART and GAM structures to incorporate genetic variables
2.2.3 Implement within-disease, all-disease, and partial-pooled disease model versions
2.2.4 Compare performance of genetic, pathogen-trait, and combined models

Task 2.3 Hybrid ML-mechanistic model development and testing

In the option year, the awardee shall develop the hybrid machine-learning mechanistic model, compare its performance to a pure ML model, and determine the switch-over time when the mechanistic model becomes more predictive in the course of the outbreak.

Subtasks

2.4.1 Establish quantitative and qualitative metrics of model performance
2.4.2 Design mechanistic model structure
2.4.3 Determine mechanistic model prior forms
2.4.4 Modify ML model to predict mechanistic parameters rather than outcomes
2.4.5Implement within-disease, all-disease, and partial-pooled disease model versions
2.4.6Measure variable contribution by re-fitting
2.4.7Analyze prediction-level variable contributions and model performance using criteria developed in Task 1.3
2.4.8Compare Hybrid and ML performance along outbreak time-series progression
2.4.9Iteratively update models to improve performance

Task 2.4 – Maintain and document project infrastructure

In the option year, the awardee shall document the methodology for extended database schema, and data ingestion pipelines, QA/QC tests, extraction routes, and ML models established in Tasks 2.1-2.3.

Subtasks

2.4.1 Write and maintain initial codebase documentation
2.4.2 Perform code review, testing, and validation

OPTION TASK (OPTION II):

Task 3.1 – Develop Model Graphical User Interface

As an additional optional task, the awardee shall develop a graphical user interface (GUI) for the ML model developed in task 1.3, allowing users to input of early-stage outbreak data and generate predictions, uncertainty bounds, and interpretable explanations of influential variables.

Subtasks

3.1.1 Port model into portable framework usable for standalone or web-based interaction
3.1.2 Optimize for rapid response time and application size
3.1.3 Design input interface
3.1.4 Design visualizations for predictions, uncertainty, and variable importance

Task 3.2 – Maintain and document project infrastructure

In the option task, the awardee shall document usage of the GUI, and perform code review of testing and validation of the GUI codebase created in tasks 3.1

Subtasks

3.2.1 Create GUI documentation
3.2.2 Perform code review, testing, and validation

Deliverables

- Reports and Documents
  - Monthly reports on task status
  - Monthly cost statement
  - Periodic program reviews (virtual and/or in person)
  - Annual technical report, which shall include
    - Executive Summary
    - I. Introduction/Background
    - II. Methodology
    - III. Findings
    - IV. Discussion/Future Recommendations
    - V. Conclusion
    - VI. Appendices
      - a. Snapshots of GUI/how to use
      - b. Data worksheet (summarizing list of data sources used, metadata abstracted, links, etc.)
- Source and executable software code
- Project databases
- Technical papers describing algorithm design and performance
- Conference presentations

Code Modules and Database Archives

Code and databases will be made available for download and provided electronically via DoD SAFE and/or on-disk to DTRA at the end of the period of performance.

Note: The data and information collected in this effort is funded on the condition that it will not be released to another nation or international organization without the specific authority from the Defense Threat Reduction Agency. Individual or corporate rights originating in the information, whether patented or not, will be respected; that the recipient government will report promptly to the Defense Threat Reduction Agency any known or suspected compromise and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States. No U.S. Government commitment to sell, lend, lease, co-develop, or co-produce defense articles is implied or intended. Also, regardless of any other markings on the document, it will not be downgraded or declassified without written approval of the originating U.S. agency.

Gantt Chart

Description	Y1 Q1-2	Y1 Q3-4	Y2 Q1-2	Y3 Q3-4
Year 1, Milestone 1				
1.1.1 Layout a provision project network	■			
1.1.2 Set up continious integration pipelines	■			
1.1.3 Implement backup and data verification jobs	■			
1.1.4 Implement differential privacy testing	■			
1.2.1 Design database schema	■			
1.2.2 Write pipelines to ingest data	■			
1.2.3 Cross-link data sources via common ontology	■			
1.2.4 Write quality assurance/quality control (QA/QC) tests for data and perform data cleaning	■	■		
1.2.5 Create automatic extraction routines to populate relevant predictors from location information	■	■		
1.2.6 Update data from live sources and clean and maintain data continuously	■	■		
1.3.1 Establish quantitative and qualitative metrics of model performance	■			
1.3.2 Implement "practical naïve" model baseline	■			
1.3.3 Design model structure	■			
1.3.4 Design alternative structure	■	■		
1.3.5 Implement within-disease, all-disease, and partial-pooled disease model versions	■	■		
1.3.6 Measure variable contribution by re-fitting		■		
1.3.7 Analyze prediction-level variable contributions and model performance		■		
1.3.8 Iteratively update models to improve performance		■		
1.4.1 Write and maintain initial codebase documentation	■	■		
1.4.2 Perform code review, testing, and validation	■	■		
Option Year 1 (Option I)				
2.1.1 Extend database schema to include genetic data			■	
2.1.2 Write pipelines to ingest genetic data			■	
2.1.3 Cross-link data sources via common ontologies			■	
2.1.4 Write QA/QC tests for data and perform data cleaning			■	■
2.1.5 Update data from live sources and clean and maintain data continuously			■	■
2.2.1 Develop genetic predictor variable set via neural-network autoencoding			■	
2.2.2 Modify BART and GAM structures to incorporate genetic variables			■	
2.2.3 Implement within-disease, all-disease, and partial-pooled disease models			■	
2.2.4 Compare performance of genetic, pathogen-trait, and combined models			■	
2.4.1 Establish quantitative and qualitative metrics of model performance			■	
2.4.2 Design mechanistic model structure			■	
2.4.3 Determine mechanistic model prior forms			■	
2.4.4 Modify ML model to predict mechanistic parameters rather than outcomes			■	
2.4.5 Implement within-disease, all-disease, and partial-pooled disease model versions			■	■
2.4.6 Measure variable contribution by re-fitting			■	■
2.4.7 Analyze prediction-level variable contributions and model performance				■
2.4.8 Compare Hybrid and ML performance along outbreak time-series progression				■
2.4.9 Iteratively update models to improve performance				■
2.5.1 Write and maintain initial codebase documentation			■	■
2.5.2 Perform code review, testing, and validation			■	■
Option Task (Option II)				
3.1.1 Port model into portable framework usable for standalone or web-based interaction			■	
3.1.2 Optimize for rapid response time and application size			■	
3.1.3 Design input interface			■	
3.1.4 Design visualizations for predictions, uncertainty, and variable importance			■	
3.2.1 Create GUI documentation			■	
3.2.2 Perform code review, testing, and validation			■	

Attachment 1 - Statement of Work (SOW)
Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning
Document Date: ~~May 28~~ November 25, 2020

Objective
The project's objectives are to determine the efficacy of machine learning (ML) techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats, both intentional (e.g. novel genetically-modified pathogens) and natural (e.g. zoonotic). Specifically, we will answer three questions that will enable rapid decision-making based on ML models of epidemic impacts:

Q1: How much does partial-pooling improve predictions of epidemic impacts, and what information transfers best across diseases?
Q2: What variables are most predictive of epidemic impacts at early stages of an outbreak?
Q3: At what point in epidemic growth do hybrid models that incorporate mechanistic epidemiological components become more accurate than pure ML models?

This work will contribute to fundamental knowledge of properties and variables that contribute most to predictive accuracy at early-stage stages in emerging outbreak prediction and forecasting. It will enable the development of robust and deployable predictive models at early stages of outbreaks, and support informed choices for data collection and model selection.

Scope
The awardee proposes a two-year study to determine the efficacy of ML techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats. The awardee team shall focus on the following major goals and milestones:

- *Year 1, Milestone 1 (6 months)*: Create and curate predictor database, project infrastructure, continuous integration/validation, establish data-imputation and automatic predictor workflow (Tasks 1.1-1.2).
- *Year 1, Milestone 2 (12 months)*: Bayesian additive regression tree (BART) model fitting and tuning, determination of variable contribution to prediction accuracy (Task 1.3).
- ~~*Option* Year 1~~, *Milestone 3 (12~~8~~ months)*: Maintain and document project infrastructure.
- *Option Year 1, Milestone 4 (18 months)*: Extend the database to include additional predictors, extend the BART model to ingest genetic data (Tasks 2.1-2.3)
- *Option Year, Milestone 5~~4~~* (24 months): Construction of hybrid ML/mechanistic model structure, comparative testing of pure and hybrid version, determination of timing when current data overtakes transfer data (Task 2.4)

Background
Situational awareness and risk assessment are critical at early stages of disease outbreaks, when interventions can best mitigate adverse outcomes. Yet decision-makers often face a paucity of data at these stages. Traditional modeling methods to forecast disease impact severity rely heavily on prior knowledge or assumptions about mechanisms of disease spread progression, and they frequently do not anticipate the actual mechanisms.[1-3] They also take considerable time and effort to develop.

Commented (b)(6) By early stage do you mean prior to an epidemic being defined as an epidemic i.e., The ML algorithm will be able to detect a spike in initial few case counts above baseline and then forecast outcomes or do you intend for the ML algorithm to forecast impacts once an epidemic has been declared then forecasting outcomes in the early stages of an epidemic? Ideally it is the former, as that would address the capability gap of "preparing for surprise." Please clarify.

Recent theory suggests disease dynamics are fundamentally predictable[4], and ML methods have been successfully applied in emerging disease science. ML refers to a group of methods, ranging from simple nearest-neighbor approaches to function-approximation methods such as boosted trees and penalized splines, to complex deep-learning neural networks. ML has been used to predict the likelihood of disease emergence and the zoonotic potential of various hosts and viruses[5,6], and deep-learning approaches have been used to infer viral hosts from the comparatively richer data of genetic sequences of viruses.[7,8]

ML methods are generally unstructured, flexible, and offer greater predictive power over traditional statistical approaches. However, these methods are data-intensive, and a key challenge with ML development is data paucity and/or a low signal-to-noise ratio. Surveillance data for even existing, well-studied diseases is rarely rich enough for the data scale of many modern ML techniques. For instance, a ML approach to predict impacts from a new outbreak of Ebola would draw training data from fewer than twenty previous events, each with varying levels of data coverage.

Transfer learning, or data fusion, provides a solution to data paucity issues by using data from other domains to train parts of models that are general, thus limiting new data requirements for more specific components. Hierarchical modeling, or *partial pooling*, is a transfer learning approach for partitioning out which data can be shared between models and which are only applicable to a specific case. For instance, Ebola forecasts for countries outside the historic range of the disease may be improved by calibrating against Cholera outbreaks, which have occurred both within and outside countries with Ebola outbreaks. The degree to which the disease outcomes are correlated is learned, rather than assumed.

An alternative recent development in disease forecasting is the development of hybrid models that incorporate simple mechanistic structures and predictive ML methods to learn model parameters. These approaches have demonstrated high predictive accuracy for near-term forecasting of epidemic growth and impact, particularly during the COVID-19 pandemic[9]. However, these approaches require adequate time-series of data to project forward from current conditions. Their utility in early stages and long-term forecasting accuracy has yet to be determined. In opting to apply these models, it is critical to understand these data requirements and at what point in an outbreak hybrid approaches can overtake pure ML early-stage predictions in accuracy. This project seeks to develop, apply, and compare pure and hybrid-ML techniques to enable the development of robust, rapidly usable predictions at early stages of outbreaks.

Key references (additional references can be found in the Technical Proposal):

1 MacDiarmid, S. C. *et al. Handbook On Import Risk Analysis for animals and animal products: quantitative risk assessment*. Vol. 2 (Office International des Épizooties, 2004).
2 Moura, J. A., McManus, C. M., Bernal, F. E. M. & de Melo, C. B. An analysis of the 1978 African swine fever outbreak in Brazil and its eradication. *Rev. Sci. Tech.* **29**, 549-563, doi:10.20506/rst.29.3.1992 (2010).
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Data Sources

Fitting and testing models will draw from disease outbreak data (counts, timing, and geography) and predictor data including pathogen traits (disease symptoms, pathogen traits, modes of transmission), pathogen sources (point of origin, geographic range of potential natural hosts), environmental context (climatic conditions, ecosystem traits), and socioeconomic context (local population densities, demographics, transportation networks, healthcare systems). Please see the Technical Proposal for available data sources.

Tasks/Scientific Goals (Format: Year.Task.Subtask)

YEAR 1

Task 1.1 – Develop and deploy project infrastructure

The awardee shall develop a computational environment that enables continuous model development and testing and allows for research and models to be reproduced and extended by external teams. The computational environment will include continuous maintenance and documentation of project codebase.

Subtasks

1.1.1 Layout a provision project network
1.1.2 Set up continuous integration pipelines
1.1.3 Implement backup and data verification jobs
1.1.4 Implement differential privacy testing
1.1.5 Write and maintain codebase documentation
1.1.6 Perform code review, testing and validation

Task 1.2 – Engineer project database

The awardee shall curate, integrate, cross-link, and validate relevant datasets from various sources into a project database, accounting for differing space and time scales, data formats, and data completeness.

Subtasks

1.2.1 Design database schema
1.2.1 Write pipelines to ingest time-series data
1.2.2 Write pipelines to ingest predictor data
1.2.3 Cross-link data sources via common ontologies

1.2.4 Write quality assurance/quality control (QA/QC) tests for data and perform data cleaning
1.2.5 Create automatic extraction routines to populate relevant predictors from location information
1.2.6 Update data from live sources and clean and maintain data continuously

Task 1.3 – Machine Learning (ML) model development and testing
The awardee shall design, implement, test, and analyze performance of ML model structures and iteratively improv them.

Subtasks
1.3.1 Implement "practical naïve" model baseline
1.3.2 Design Bayesian additive regression tree (BART) model structure
1.3.3 Design alternative generalized additive model (GAM) structure
1.3.4 Implement within-disease, all-disease, and partial-pooled disease model versions
1.3.5 Measure variable contribution by re-fitting
1.3.6 Analyze prediction-level variable contributions and model performance
1.3.7 Iteratively update models to improve performance

Commented (b)(6): Need to establish quantitative and qualitative metrics of success to evaluate model performance and compare two modeling approaches.

Task 1.4—Maintain and document project infrastructure
The awardee shall document the methodology for database schema, data ingestion pipelines, QA/QC tests, extraction routes, and ML models established in Tasks 1.1-1.3.

Subtasks
1.4.1 Write and maintain initial codebase documentation
1.4.2 Perform code review, testing, and validation
1.3.7

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OPTION YEAR:

Task 2.1 – Maintain and document project infrastructure
~~In the option year, the awardee shall continue to perform maintenance and documentation of~~ project codebase to ensure reproducibility and reusability of additional components

Subtasks
~~2.1.1 Write and maintain codebase documentation~~
~~2.1.2 Perform code review, testing and validation~~

Task 2.12 – Extend project database
In the option year, the awardee shall extend the database to include additional predictors and continuously maintain and update to accumulate more data from upstream sources.

Subtasks
2.2.1 Extend database schema to include genetic data and auto-encoded variables
2.2.2 Write pipelines to ingest genetic data
2.2.3 Cross-link data sources via common ontologies
2.2.4 Write QA/QC tests for data and perform data cleaning
2.2.5 Update data from live sources and clean and maintain data continuously

Task 2.3 – Extend BART model
In the option year, the awardee shall extend the BART model to ingest genetic data and test the contribution of this data in enhancing or recapitulating pathogen trait data.

Subtasks

2.3.1 Develop genetic predictor variable set via neural-network autoencoding
2.3.2 Modify BART and GAM structures to incorporate genetic variables
2.3.3 Implement within-disease, all-disease, and partial-pooled disease model versions
2.3.4 Compare performance of genetic, pathogen-trait, and combined models

Task 2.4 – Hybrid ML-mechanistic model development and testing

In the option year, the awardee shall develop the hybrid machine-learning mechanistic model, compare its performance to a pure ML model, and determine the switch-over time when the mechanistic model becomes more predictive in the course of the outbreak.

Subtasks

2.4.1 Design mechanistic model structure
2.4.2 Determine mechanistic model prior forms
2.4.3 Modify ML model to predict mechanistic parameters rather than outcomes
2.4.4 Implement within-disease, all-disease, and partial-pooled disease model versions
2.4.5 Measure variable contribution by re-fitting
2.4.6 Analyze prediction-level variable contributions and model performance using criteria developed in SubTask 1.3.6
2.4.7 Compare Hybrid and ML performance along outbreak time-series progression
2.4.8 Iteratively update models to improve performance

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2.4.8

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OPTIONAL Task 2.5—Develop GUI of alpha prototype (Year 1)

The awardee shall develop an alpha prototype of an end user GUI of the hybrid machine-learning mechanistic model and pure ML model to include data visualizations to forecast one class of diseases (e.g., airborne person to person transmissible).

Deliverables

Reports and Documents

- Monthly reports on task status
- Monthly cost statement
- Annual technical report
- Source and executable software code
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IV. Discussion/Future Recommendations
V. Conclusion
VI. Appendices
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b. Data worksheet (summarizing list of data sources used, metadata abstracted, links, etc.)
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Code Modules and Database Archives

All code modules and documentation will be continually available on EcoHealth Alliance's GitHub page with access provided to DTRA. Databases will be made available for download and provided electronically via DoD SAFE and/or on-disk to DTRA at the end of the period of performance. ~~per request~~.

Please note: The data and information collected in this effort is funded on the condition that it will not be released to another nation or international organization without the specific authority from the Defense Threat Reduction Agency. Individual or corporate rights originating in the information, whether patented or not, will be respected; that the recipient government will report promptly to the Defense Threat Reduction Agency any known or suspected compromise and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States. No U.S. Government commitment to sell, lend, lease, co develop, or co produce defense articles is implied or intended. Also, regardless of any other markings on the document, it will not be downgraded or declassified without written approval of the originating U.S. agency.

From: (b)(6)
To:
Subject: FW: FY21 DTRA Fundamental Research Award
Date: Thursday, January 21, 2021 8:46:01 AM
Attachments: EHA Statement of Work v3.docx

Please see email below intended for (b)(6)

Thank you,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Thursday, January 21, 2021 8:39 AM
To: (b)(6)
Subject: FY21 DTRA Fundamental Research Award

(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6) and I am a Science and Technology Manager (STM) in the Digital Battlespace Management Division at the Defense Threat Reduction Agency (DTRA). I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

DTRA CB is still awaiting receipt of the remaining FY21 funds Congress has appropriated, however, prior to award and kick off of this effort, we can work collaboratively to finalize the SOW and cost negotiations so we are on track to kick off this grant award in the first quarter of this calendar year. To that end, I have attached a red lined SOW that has DTRA requested changes for the proposed effort. Please review so we can discuss next steps. During these follow on discussions, please be prepared to discuss any questions, concerns, and associated cost, schedule, and contract changes that may need to be completed to address the requested changes.

The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday February 9th from 1000-1100 work for your team?

Look forward to working with you.

Attachment 1 - Statement of Work (SOW)
Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning
Document Date: ~~May 28~~ November 25, 2020

Objective
The project's objectives are to determine the efficacy of machine learning (ML) techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats, both intentional (e.g. novel genetically-modified pathogens) and natural (e.g. zoonotic). Specifically, we will answer three questions that will enable rapid decision-making based on ML models of epidemic impacts:

Q1: How much does partial-pooling improve predictions of epidemic impacts, and what information transfers best across diseases?
Q2: What variables are most predictive of epidemic impacts at early stages of an outbreak?
Q3: At what point in epidemic growth do hybrid models that incorporate mechanistic epidemiological components become more accurate than pure ML models?

This work will contribute to fundamental knowledge of properties and variables that contribute most to predictive accuracy at early-stage stages in emerging outbreak prediction and forecasting. It will enable the development of robust and deployable predictive models at early stages of outbreaks, and support informed choices for data collection and model selection.

Scope
The awardee proposes a two-year study to determine the efficacy of ML techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats. The awardee team shall focus on the following major goals and milestones:

- *Year 1, Milestone 1 (6 months)*: Create and curate predictor database, project infrastructure, continuous integration/validation, establish data-imputation and automatic predictor workflow (Tasks 1.1-1.2).
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- ~~*Option*~~ *Year 1, Milestone 3 (12~~*8 months)*: Maintain and document project infrastructure,
- *Option Year 1, Milestone 4 (18 months)*: Extend the database to include additional predictors, extend the BART model to ingest genetic data (Tasks 2.1-2.3)
- *Option Year, Milestone 54* (24 months): Construction of hybrid ML/mechanistic model structure, comparative testing of pure and hybrid version, determination of timing when current data overtakes transfer data (Task 2.4)

Background
Situational awareness and risk assessment are critical at early stages of disease outbreaks, when interventions can best mitigate adverse outcomes. Yet decision-makers often face a paucity of data at these stages. Traditional modeling methods to forecast disease impact severity rely heavily on prior knowledge or assumptions about mechanisms of disease spread progression, and they frequently do not anticipate the actual mechanisms.[1-5] They also take considerable time and effort to develop.

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Tasks/Scientific Goals (Format: Year.Task.Subtask)

YEAR 1

Task 1.1 – Develop and deploy project infrastructure

The awardee shall develop a computational environment that enables continuous model development and testing and allows for research and models to be reproduced and extended by external teams. The computational environment will include continuous maintenance and documentation of project codebase.

Subtasks

1.1.1 Layout a provision project network
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1.1.4 Implement differential privacy testing
1.1.5 Write and maintain codebase documentation
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Task 1.3 – Machine Learning (ML) model development and testing
The awardee shall design, implement, test, and analyze performance of ML model structures and iteratively improv them.

Subtasks
1.3.1 Implement "practical naïve" model baseline
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1.3.4 Implement within-disease, all-disease, and partial-pooled disease model versions
1.3.5 Measure variable contribution by re-fitting
1.3.6 Analyze prediction-level variable contributions and model performance
1.3.7 Iteratively update models to improve performance

Commented [BSC2]: Need to establish quantitative and qualitative metrics of success to evaluate model performance and compare two modeling approaches.

Task 1.4—Maintain and document project infrastructure
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Subtasks
1.4.1 Write and maintain initial codebase documentation
1.4.2 Perform code review, testing, and validation
~~1.3.7~~

OPTION YEAR:
~~**Task 2.1 – Maintain and document project infrastructure**~~
~~In the option year, the awardee shall continue to perform maintenance and documentation of~~ project codebase to ensure reproducibility and reusability of additional components
~~*Subtasks*~~
~~2.1.1 Write and maintain codebase documentation~~
~~2.1.2 Perform code review, testing and validation~~

Task 2.1~~2~~ – Extend project database
In the option year, the awardee shall extend the database to include additional predictors and continuously maintain and update to accumulate more data from upstream sources.
Subtasks
2.2.1 Extend database schema to include genetic data and auto-encoded variables
2.2.2 Write pipelines to ingest genetic data
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2.2.4 Write QA/QC tests for data and perform data cleaning
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Task 2.3 – Extend BART model
In the option year, the awardee shall extend the BART model to ingest genetic data and test the contribution of this data in enhancing or recapitulating pathogen trait data.
Subtasks

2.3.1 Develop genetic predictor variable set via neural-network autoencoding
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Task 2.4 – Hybrid ML-mechanistic model development and testing

In the option year, the awardee shall develop the hybrid machine-learning mechanistic model, compare its performance to a pure ML model, and determine the switch-over time when the mechanistic model becomes more predictive in the course of the outbreak.

Subtasks

2.4.1 Design mechanistic model structure
2.4.2 Determine mechanistic model prior forms
2.4.3 Modify ML model to predict mechanistic parameters rather than outcomes
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2.4.6 Analyze prediction-level variable contributions and model performance using criteria developed in SubTask 1.3.6
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2.4.8 Iteratively update models to improve performance

~~2.4.8~~

OPTIONAL Task 2.5—Develop GUI of alpha prototype (Year 1)

The awardee shall develop an alpha prototype of an end user GUI of the hybrid machine-learning mechanistic model and pure ML model to include data visualizations to forecast one class of diseases (e.g., airborne person to person transmissible).

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Commented [BSC3]: Need to establish quantitative and qualitative metrics of success to evaluate model performance and compare two modeling approaches.

Commented [BSC4]: The annual technical report shall include the following sections at a minimum:
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VI.Appendices
a.Snapshots of GUI/how to use
b.Data worksheet (summarizing list of data sources used, metadata abstracted, links, etc.)
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V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W) (b)(6)

NIPR

SIPR

From: (b)(6)
To:
Subject: FY21 DTRA Fundamental Research Award
Date: Thursday, January 21, 2021 8:38:37 AM
Attachments: EHA Statement of Work v3.docx

(b)(6)

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(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

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Document Date: ~~May 28~~ November 25, 2020

Objective
The project's objectives are to determine the efficacy of machine learning (ML) techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats, both intentional (e.g. novel genetically-modified pathogens) and natural (e.g. zoonotic). Specifically, we will answer three questions that will enable rapid decision-making based on ML models of epidemic impacts:

Q1: How much does partial-pooling improve predictions of epidemic impacts, and what information transfers best across diseases?
Q2: What variables are most predictive of epidemic impacts at early stages of an outbreak?
Q3: At what point in epidemic growth do hybrid models that incorporate mechanistic epidemiological components become more accurate than pure ML models?

This work will contribute to fundamental knowledge of properties and variables that contribute most to predictive accuracy at early-stage stages in emerging outbreak prediction and forecasting. It will enable the development of robust and deployable predictive models at early stages of outbreaks, and support informed choices for data collection and model selection.

Scope
The awardee proposes a two-year study to determine the efficacy of ML techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats. The awardee team shall focus on the following major goals and milestones:

- *Year 1, Milestone 1 (6 months)*: Create and curate predictor database, project infrastructure, continuous integration/validation, establish data-imputation and automatic predictor workflow (Tasks 1.1-1.2).
- *Year 1, Milestone 2 (12 months)*: Bayesian additive regression tree (BART) model fitting and tuning, determination of variable contribution to prediction accuracy (Task 1.3).
- ~~*Option*~~ *Year 1, Milestone 3 (12~~*8 months)*: Maintain and document project infrastructure,
- *Option Year 1, Milestone 4 (18 months)*: Extend the database to include additional predictors, extend the BART model to ingest genetic data (Tasks 2.1-2.3)
- *Option Year, Milestone 54* (24 months): Construction of hybrid ML/mechanistic model structure, comparative testing of pure and hybrid version, determination of timing when current data overtakes transfer data (Task 2.4)

Background
Situational awareness and risk assessment are critical at early stages of disease outbreaks, when interventions can best mitigate adverse outcomes. Yet decision-makers often face a paucity of data at these stages. Traditional modeling methods to forecast disease impact severity rely heavily on prior knowledge or assumptions about mechanisms of disease spread progression, and they frequently do not anticipate the actual mechanisms.[1-5] They also take considerable time and effort to develop.

Commented [BSC1]: By early stage do you mean prior to an epidemic being defined as an epidemic i.e., The ML algorithm will be able to detect a spike in initial few case counts above baseline and then forecast outcomes or do you intend for the ML algorithm to forecast impacts once an epidemic has been declared then forecasting outcomes in the early stages of an epidemic? Ideally it is the former, as that would address the capability gap of "preparing for surprise." Please clarify.

Recent theory suggests disease dynamics are fundamentally predictable[4], and ML methods have been successfully applied in emerging disease science. ML refers to a group of methods, ranging from simple nearest-neighbor approaches to function-approximation methods such as boosted trees and penalized splines, to complex deep-learning neural networks. ML has been used to predict the likelihood of disease emergence and the zoonotic potential of various hosts and viruses[5,6], and deep-learning approaches have been used to infer viral hosts from the comparatively richer data of genetic sequences of viruses.[7,8]

ML methods are generally unstructured, flexible, and offer greater predictive power over traditional statistical approaches. However, these methods are data-intensive, and a key challenge with ML development is data paucity and/or a low signal-to-noise ratio. Surveillance data for even existing, well-studied diseases is rarely rich enough for the data scale of many modern ML techniques. For instance, a ML approach to predict impacts from a new outbreak of Ebola would draw training data from fewer than twenty previous events, each with varying levels of data coverage.

Transfer learning, or data fusion, provides a solution to data paucity issues by using data from other domains to train parts of models that are general, thus limiting new data requirements for more specific components. Hierarchical modeling, or *partial pooling*, is a transfer learning approach for partitioning out which data can be shared between models and which are only applicable to a specific case. For instance, Ebola forecasts for countries outside the historic range of the disease may be improved by calibrating against Cholera outbreaks, which have occurred both within and outside countries with Ebola outbreaks. The degree to which the disease outcomes are correlated is learned, rather than assumed.

An alternative recent development in disease forecasting is the development of hybrid models that incorporate simple mechanistic structures and predictive ML methods to learn model parameters. These approaches have demonstrated high predictive accuracy for near-term forecasting of epidemic growth and impact, particularly during the COVID-19 pandemic[9]. However, these approaches require adequate time-series of data to project forward from current conditions. Their utility in early stages and long-term forecasting accuracy has yet to be determined. In opting to apply these models, it is critical to understand these data requirements and at what point in an outbreak hybrid approaches can overtake pure ML early-stage predictions in accuracy. This project seeks to develop, apply, and compare pure and hybrid-ML techniques to enable the development of robust, rapidly usable predictions at early stages of outbreaks.

Key references (additional references can be found in the Technical Proposal):

1 MacDiarmid, S. C. *et al. Handbook On Import Risk Analysis for animals and animal products: quantitative risk assessment*. Vol. 2 (Office International des Épizooties, 2004).
2 Moura, J. A., McManus, C. M., Bernal, F. E. M. & de Melo, C. B. An analysis of the 1978 African swine fever outbreak in Brazil and its eradication. *Rev. Sci. Tech.* **29**, 549-563, doi:10.20506/rst.29.3.1992 (2010).
3 Delgado, J. *et al.* U.K. Foot and Mouth Disease: A Systemic Risk Assessment of Existing Controls. *Risk Anal.* **37**, 1768-1782, doi:10.1111/risa.12704 (2017).

4 Scarpino, S. V. & Petri, G. On the predictability of infectious disease outbreaks. *Nat. Commun.* **10**, 898, doi:10.1038/s41467-019-08616-0 (2019).
5 Olival, K. J. *et al.* Host and viral traits predict zoonotic spillover from mammals. *Nature*, doi:10.1038/nature22975 (2017).
6 Allen, T. *et al.* Global hotspots and correlates of emerging zoonotic diseases. *Nat. Commun.* **8**, 1124, doi:10.1038/s41467-017-00923-8 (2017).
7 Mock, F., Viehweger, A., Barth, E. & Marz, M. VIDHOP, viral host prediction with Deep Learning. *Bioinformatics* (2019).
8 Babayan, S. A., Orton, R. J. & Streicker, D. G. Predicting reservoir hosts and arthropod vectors from evolutionary signatures in RNA virus genomes. *Science* **362**, 577-580, doi:10.1126/science.aap9072 (2018).
9 Gu, Y. *COVID-19 Projections Using Machine Learning*, <https://covid19-projections.com/about/#historical-performance> (2020).

Data Sources

Fitting and testing models will draw from disease outbreak data (counts, timing, and geography) and predictor data including pathogen traits (disease symptoms, pathogen traits, modes of transmission), pathogen sources (point of origin, geographic range of potential natural hosts), environmental context (climatic conditions, ecosystem traits), and socioeconomic context (local population densities, demographics, transportation networks, healthcare systems). Please see the Technical Proposal for available data sources.

Tasks/Scientific Goals (Format: Year.Task.Subtask)

YEAR 1

Task 1.1 – Develop and deploy project infrastructure

The awardee shall develop a computational environment that enables continuous model development and testing and allows for research and models to be reproduced and extended by external teams. The computational environment will include continuous maintenance and documentation of project codebase.

Subtasks

1.1.1 Layout a provision project network
1.1.2 Set up continuous integration pipelines
1.1.3 Implement backup and data verification jobs
1.1.4 Implement differential privacy testing
1.1.5 Write and maintain codebase documentation
1.1.6 Perform code review, testing and validation

Task 1.2 – Engineer project database

The awardee shall curate, integrate, cross-link, and validate relevant datasets from various sources into a project database, accounting for differing space and time scales, data formats, and data completeness.

Subtasks

1.2.1 Design database schema
1.2.1 Write pipelines to ingest time-series data
1.2.2 Write pipelines to ingest predictor data
1.2.3 Cross-link data sources via common ontologies

1.2.4 Write quality assurance/quality control (QA/QC) tests for data and perform data cleaning
1.2.5 Create automatic extraction routines to populate relevant predictors from location information
1.2.6 Update data from live sources and clean and maintain data continuously

Task 1.3 – Machine Learning (ML) model development and testing
The awardee shall design, implement, test, and analyze performance of ML model structures and iteratively improv them.

Subtasks
1.3.1 Implement "practical naïve" model baseline
1.3.2 Design Bayesian additive regression tree (BART) model structure
1.3.3 Design alternative generalized additive model (GAM) structure
1.3.4 Implement within-disease, all-disease, and partial-pooled disease model versions
1.3.5 Measure variable contribution by re-fitting
1.3.6 Analyze prediction-level variable contributions and model performance
1.3.7 Iteratively update models to improve performance

Commented [BSC2]: Need to establish quantitative and qualitative metrics of success to evaluate model performance and compare two modeling approaches.

Task 1.4—Maintain and document project infrastructure
The awardee shall document the methodology for database schema, data ingestion pipelines, QA/QC tests, extraction routes, and ML models established in Tasks 1.1-1.3.
Subtasks
1.4.1 Write and maintain initial codebase documentation
1.4.2 Perform code review, testing, and validation
~~1.3.7~~

OPTION YEAR:
~~**Task 2.1 – Maintain and document project infrastructure**~~
~~In the option year, the awardee shall continue to perform maintenance and documentation of~~ project codebase to ensure reproducibility and reusability of additional components
~~*Subtasks*~~
~~2.1.1 Write and maintain codebase documentation~~
~~2.1.2 Perform code review, testing and validation~~

Task 2.1~~2~~ – Extend project database
In the option year, the awardee shall extend the database to include additional predictors and continuously maintain and update to accumulate more data from upstream sources.
Subtasks
2.2.1 Extend database schema to include genetic data and auto-encoded variables
2.2.2 Write pipelines to ingest genetic data
2.2.3 Cross-link data sources via common ontologies
2.2.4 Write QA/QC tests for data and perform data cleaning
2.2.5 Update data from live sources and clean and maintain data continuously

Task 2.3 – Extend BART model
In the option year, the awardee shall extend the BART model to ingest genetic data and test the contribution of this data in enhancing or recapitulating pathogen trait data.
Subtasks

2.3.1 Develop genetic predictor variable set via neural-network autoencoding
2.3.2 Modify BART and GAM structures to incorporate genetic variables
2.3.3 Implement within-disease, all-disease, and partial-pooled disease model versions
2.3.4 Compare performance of genetic, pathogen-trait, and combined models

Task 2.4 – Hybrid ML-mechanistic model development and testing

In the option year, the awardee shall develop the hybrid machine-learning mechanistic model, compare its performance to a pure ML model, and determine the switch-over time when the mechanistic model becomes more predictive in the course of the outbreak.

Subtasks

2.4.1 Design mechanistic model structure
2.4.2 Determine mechanistic model prior forms
2.4.3 Modify ML model to predict mechanistic parameters rather than outcomes
2.4.4 Implement within-disease, all-disease, and partial-pooled disease model versions
2.4.5 Measure variable contribution by re-fitting
2.4.6 Analyze prediction-level variable contributions and model performance using criteria developed in SubTask 1.3.6
2.4.7 Compare Hybrid and ML performance along outbreak time-series progression
2.4.8 Iteratively update models to improve performance

~~2.4.8~~

OPTIONAL Task 2.5—Develop GUI of alpha prototype (Year 1)

The awardee shall develop an alpha prototype of an end user GUI of the hybrid machine-learning mechanistic model and pure ML model to include data visualizations to forecast one class of diseases (e.g., airborne person to person transmissible).

Deliverables

Reports and Documents

- Monthly reports on task status
- Monthly cost statement
- Annual technical report
- Source and executable software code
- Technical papers describing algorithm design and performance
- Conference presentations

Code Modules and Database Archives

All code modules and documentation will be continually available on EcoHealth Alliance's GitHub page with access provided to DTRA. Databases will be made available for download and provided electronically via DoD SAFE and/or on-disk to DTRA at the end of the period of performance, per request.

Please note: The data and information collected in this effort is funded on the condition that it will not be released to another nation or international organization without the specific authority from the Defense Threat Reduction Agency. Individual or corporate rights originating in the information, whether patented or not, will be respected; that the recipient government will report promptly to the Defense Threat Reduction Agency any known or suspected compromise and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States. No U.S. Government commitment to sell, lend, lease, co-develop, or co-produce defense articles is implied or intended. Also, regardless of any other markings on the document, it will not be downgraded or declassified without written approval of the originating U.S. agency.

Commented [BSC3]: Need to establish quantitative and qualitative metrics of success to evaluate model performance and compare two modeling approaches.

Commented [BSC4]: The annual technical report shall include the following sections at a minimum:
Executive Summary
I.Introduction/Background
II. Methodology
III.Findings
IV.Discussion/Future Recommendations
V.Conclusion
VI.Appendices
a.Snapshots of GUI/how to use
b.Data worksheet (summarizing list of data sources used, metadata abstracted, links, etc.)
User specified format on report is acceptable.

(b)(6)

NIPR (b)(6)

SIPR:

REPORT OF INVENTIONS AND SUBCONTRACTS

(Pursuant to "Patent Rights" Contract Clause) (See Instructions on back)

Form Approved
OMB No. 9000-0095
Expires Jan 31, 2008

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION. RETURN COMPLETED FORM TO THE CONTRACTING OFFICER.

1.a. NAME OF CONTRACTOR/SUBCONTRACTOR	a. CONTRACT NUMBER	2.a. NAME OF GOVERNMENT PRIME CONTRACTOR	c. CONTRACT NUMBER	3. TYPE OF REPORT (X one)
Clango, Inc	GRITS-DJT-FY16-1	EcoHealth Alliance	HDTRA1-15-0041	a. INTERIM [X] b. FINAL

b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	4. REPORTING PERIOD (YYYYMMDD)
2107 Wilson Blvd Suite 100 Arlington, VA 22201	20160501	460 West 34th street, 17th floor New York, NY 10001	20150409	a. FROM 20150409 b. TO 20170930

SECTION I - SUBJECT INVENTIONS

5. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME(S) OF INVENTOR(S) (Last, First, Middle Initial) a.	TITLE OF INVENTION(S) b.	DISCLOSURE NUMBER, PATENT APPLICATION SERIAL NUMBER OR PATENT NUMBER c.	ELECTION TO FILE PATENT APPLICATIONS (X) d.				CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER (X) e.	
			(1) UNITED STATES		(2) FOREIGN			
			(a) YES	(b) NO	(a) YES	(b) NO	(a) YES	(b) NO
Matta, Stpehen Yodder, James	Global Rapid Identification Tool Set (GRITS)			X		X		X
Matta, Stpehen Yodder, James	Flight Risk Tracker (FLIRT)			X		X		X
Matta, Stpehen Yodder, James	EIDR Connect			X		X		X

f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR		g. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED	
(1) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(2) (a) NAME OF INVENTOR (Last, First, Middle Initial)	(1) TITLE OF INVENTION	(2) FOREIGN COUNTRIES OF PATENT APPLICATION
(b) NAME OF EMPLOYER	(b) NAME OF EMPLOYER		
(c) ADDRESS OF EMPLOYER (Include ZIP Code)	(c) ADDRESS OF EMPLOYER (Include ZIP Code)		

SECTION II - SUBCONTRACTS *(Containing a "Patent Rights" clause)*

6. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR *(If "None," so state)*

NAME OF SUBCONTRACTOR(S) a.	ADDRESS (Include ZIP Code) b.	SUBCONTRACT NUMBER(S) c.	FAR "PATENT RIGHTS" d.		DESCRIPTION OF WORK TO BE PERFORMED UNDER SUBCONTRACT(S) e.	SUBCONTRACT DATES (YYYYMMDD) f.	
			(1) CLAUSE NUMBER	(2) DATE (YYYYMM)		(1) AWARD	(2) ESTIMATED COMPLETION

SECTION III - CERTIFICATION

7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR *(Not required if: (X as appropriate))* | SMALL BUSINESS or | NONPROFIT ORGANIZATION

I certify that the reporting party has procedures for prompt identification and timely disclosure of "Subject Inventions," that such procedures have been followed and that all "Subject Inventions" have been reported.

a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL (Last, First, Middle Initial)	b. TITLE	c. SIGNATURE	d. DATE SIGNED
McGeehan, Patrick	VP of Service Delivery		20180216

DD FORM 882 INSTRUCTIONS

GENERAL

This form is for use in submitting INTERIM and FINAL invention reports to the Contracting Officer and for use in reporting the award of subcontracts containing a "Patent Rights" clause. If the form does not afford sufficient space, multiple forms may be used or plain sheets of paper with proper identification of information by item number may be attached.

An INTERIM report is due at least every 12 months from the date of contract award and shall include (a) a listing of "Subject Inventions" during the reporting period, (b) a certification of compliance with required invention identification and disclosure procedures together with a certification of reporting of all "Subject Inventions," and (c) any required information not previously reported on subcontracts containing a "Patent Rights" clause.

A FINAL report is due within 6 months if contractor is a small business firm or domestic nonprofit organization and within 3 months for all others after completion of the contract work and shall include (a) a listing of all "Subject Inventions" required by the contract to be reported, and (b) any required information not previously reported on subcontracts awarded during the course of or under the contract and containing a "Patent Rights" clause.

While the form may be used for simultaneously reporting inventions and subcontracts, it may also be used for reporting, promptly after award, subcontracts containing a "Patent Rights" clause.

Dates shall be entered where indicated in certain items on this form and shall be entered in six or eight digit numbers in the order of year and month (YYYYMM) or year, month and day (YYYYMMDD). Example: April 2005 should be entered as 200504 and April 15, 2005 should be entered as 20050415.

1.a. Self-explanatory.

1.b. Self-explanatory.

1.c. If "same" as Item 2.c., so state.

1.d. Self-explanatory.

2.a. If "same" as Item 1.a., so state.

2.b. Self-explanatory.

2.c. Procurement Instrument Identification (PII) number of contract (DFARS 204.7003).

2.d. through 5.e. Self-explanatory.

5.f. The name and address of the employer of each inventor not employed by the contractor or subcontractor is needed because the Government's rights in a reported invention may not be determined solely by the terms of the "Patent Rights" clause in the contract.

Example 1: If an invention is made by a Government employee assigned to work with a contractor, the Government rights in such an invention will be determined under Executive Order 10096.

Example 2: If an invention is made under a contract by joint inventors and one of the inventors is a Government employee, the Government's rights in such an inventor's interest in the invention will also be determined under Executive Order 10096, except where the contractor is a small business or nonprofit organization, in which case the provisions of 35 U.S.C. 202(e) will apply.

5.g.(1) Self-explanatory.

5.g.(2) Self-explanatory with the exception that the contractor or subcontractor shall indicate, if known at the time of this report, whether applications will be filed under either the Patent Cooperation Treaty (PCT) or the European Patent Convention (EPC). If such is known, the letters PCT or EPC shall be entered after each listed country.

6.a. Self-explanatory.

6.b. Self-explanatory.

6.c. Self-explanatory.

6.d. Patent Rights Clauses are located in FAR 52.227.

6.e. Self-explanatory.

6.f. Self-explanatory.

7. Certification not required by small business firms and domestic nonprofit organizations.

7.a. through 7.d. Self-explanatory.

DTRA Monthly Project Update DRAFT

Project Number: HDTRA-121-100023

Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

Prepared By: (b)(6)

Reporting Period: August 2021

Summary of Progress

For this start-up month, we set up our workflow structures and began data design and ingest tasks. We expect project pace to increase in months 2-3 when we complete new hiring for the project.

- Setting up repositories and hosting for project code, output, and automated workflows (1.1.1)
- Testing several options for a project database structure to optimize our workflow (1.1.1)
- Building a pipeline to ingesting data from the AIDO system (1.2.2)
- Administrative: Project kick-off with DTRA, setting up of internal project management system
- Personnel: Hiring new research scientist to join team

SOW Tasks Underway

1.1.1 Layout a provision internal project network
1.2.1 Design database schema
1.2.2 Write pipelines to ingest data
1.4.1 Write and maintain initial codebase documentation

SOW Tasks Completed

None

Current Outstanding Issues, Risks and Mitigations

We are completing team hiring this month.

Cost

TBD

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(Pursuant to "Patent Rights" Contract Clause) (See Instructions on back)

Form Approved
OMB No. 9000-0095
Expires Jan 31, 2008

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1.a. NAME OF CONTRACTOR/SUBCONTRACTOR	c. CONTRACT NUMBER	2.a. NAME OF GOVERNMENT PRIME CONTRACTOR	c. CONTRACT NUMBER	3. TYPE OF REPORT (X one)
International Society for Infectious Diseases	GRITS-ISID-FY16-1	EcoHealth Alliance	HDTRA1-15-0041	a. INTERIM [X] b. FINAL

b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	b. ADDRESS (Include ZIP Code)	d. AWARD DATE (YYYYMMDD)	4. REPORTING PERIOD (YYYYMMDD)
9 Babcock Street, Unit 3 Brookline, MA, 02446	20160409	460 West 34th street, 17th floor New York, NY 10001	20150409	a. FROM 20150409 b. TO 20170930

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			(1) UNITED STATES		(2) FOREIGN			
			(a) YES	(b) NO	(a) YES	(b) NO	(a) YES	(b) NO
Huff, Andrew; Slagle, Amy; Horton, Russell; Breit, Nathan; Preston, Nico; Allen, T	Global Rapid Identification Tool Set (GRITS)			X		X		X
Allen, Toph; Arnold, Brock; Breit, Nathan; Whiting, Karissa; Huff, Andrew	Flight Risk Tracker (FLIRT)			X		X		X
Allen, Toph; Arnold, Brock; Breit, Nathan; Whiting, Karissa	EIDR Connect			X		X		X

f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR		g. ELECTED FOREIGN COUNTRIES IN WHICH A PATENT APPLICATION WILL BE FILED	
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(b) NAME OF EMPLOYER	(b) NAME OF EMPLOYER		
(c) ADDRESS OF EMPLOYER (Include ZIP Code)	(c) ADDRESS OF EMPLOYER (Include ZIP Code)		

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			(1) CLAUSE NUMBER	(2) DATE (YYYYMM)		(1) AWARD	(2) ESTIMATED COMPLETION

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a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL (Last, First, Middle Initial)	b. TITLE	c. SIGNATURE	d. DATE SIGNED
Trimmer, Chris	Executive Director	Chris Trimmer	20180216

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1.a. Self-explanatory.

1.b. Self-explanatory.

1.c. If "same" as Item 2.c., so state.

1.d. Self-explanatory.

2.a. If "same" as Item 1.a., so state.

2.b. Self-explanatory.

2.c. Procurement Instrument Identification (PII) number of contract (DFARS 204.7003).

2.d. through 5.e. Self-explanatory.

5.f. The name and address of the employer of each inventor not employed by the contractor or subcontractor is needed because the Government's rights in a reported invention may not be determined solely by the terms of the "Patent Rights" clause in the contract.

Example 1: If an invention is made by a Government employee assigned to work with a contractor, the Government rights in such an invention will be determined under Executive Order 10096.

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6.e. Self-explanatory.

6.f. Self-explanatory.

7. Certification not required by small business firms and domestic nonprofit organizations.

7.a. through 7.d. Self-explanatory.

From: (b)(6)
To:
Cc: (b)(6)
Subject: Monthly Technical Report
Date: Wednesday, October 27, 2021 2:11:00 PM

Good Afternoon (b)(6)

Just a friendly reminder to submit a monthly technical and expenditure report for the month of September.

Thank you kindly,

(b)(6)

Advisory & Assistance Services (A&AS) - DecisionPoint

Defense Threat Reduction Agency

Research and Development Directorate (RD)

Chemical and Biological Technologies Department, Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA: (b)(6)

NIPR: (b)(6)
(b)(6)

SIPR: (b)(6)
(b)(6)

From: (b)(6)
To:
Cc:
Subject: [Non-DoD Source] Monthly report for HDTRA-121-100023
Date: Monday, September 20, 2021 2:34:44 PM
Attachments: HDTRA-121-100023_Report_2021-09-20_DRAFT.docx

Dear (b)(6)

Find attached a preliminary monthly progress report for our project. As we have been hiring, our project cadence is just getting going. My finance department tells me we'll usually have everything together for previous month's costs three weeks or so into the next month, so that's not included in this initial report, but I wanted to check that this is the level of detail you want.

Could you let us know specifically what you'd like detailed in the cost statements going forwards?

Thanks,

(b)(6)

--

(b)(6)
Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
@noamross < Caution-https://twitter.com/noamross > (twitter)

noamross.net < Caution-http://noamross.net >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

DTRA Monthly Project Update DRAFT

Project Number: HDTRA-121-100023

Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

Prepared By: Dr. Noam Ross

Reporting Period: August 2021

Summary of Progress

For this start-up month, we set up our workflow structures and began data design and ingest tasks. We expect project pace to increase in months 2-3 when we complete new hiring for the project.

- **Setting up repositories and hosting for project code, output, and automated workflows (1.1.1)**
- **Testing several options for a project database structure to optimize our workflow (1.1.1)**
- **Building a pipeline to ingesting data from the AIDO system (1.2.2)**
- **Administrative: Project kick-off with DTRA, setting up of internal project management system**
- **Personnel: Hiring new research scientist to join team**

SOW Tasks Underway

1.1.1 Layout a provision internal project network
1.2.1 Design database schema
1.2.2 Write pipelines to ingest data
1.4.1 Write and maintain initial codebase documentation

SOW Tasks Completed

None

Current Outstanding Issues, Risks and Mitigations

We are completing team hiring this month.

Cost

TBD

From: (b)(6)
To:
Cc:
Subject: [Non-DoD Source] Monthly report for HDTRA-121-100023
Date: Monday, September 20, 2021 2:31:51 PM
Attachments: HDTRA-121-100023_Report_2021-09-20_DRAFT.docx

Dear (b)(6)

Find attached a preliminary monthly progress report for our project. As we have been hiring, our project cadence is just getting going. My finance department tells me we'll usually have everything together for previous month's costs three weeks or so into the next month, so that's not included in this initial report, but I wanted to check that this is the level of detail you want.

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Thanks,

(b)(6)

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(b)(6)

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(b)(6) (direct)
(fax)
@noamross < Caution-(b)(6) (twitter)

noamross.net < Caution-(b)(6)

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DTRA Monthly Project Update DRAFT

Project Number: HDTRA-121-100023

Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

Prepared By: Dr. Noam Ross

Reporting Period: August 2021

Summary of Progress

For this start-up month, we set up our workflow structures and began data design and ingest tasks. We expect project pace to increase in months 2-3 when we complete new hiring for the project.

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SOW Tasks Underway

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1.2.1 Design database schema
1.2.2 Write pipelines to ingest data
1.4.1 Write and maintain initial codebase documentation

SOW Tasks Completed

None

Current Outstanding Issues, Risks and Mitigations

We are completing team hiring this month.

Cost

TBD

From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Monthly report for HDTRA-121-100023
Date: Monday, September 20, 2021 2:55:00 PM

Received and approved, thanks (b)(6)

Going forward, you can submit the monthly report after you receive your internal reporting of expenditures for the previous month.

We are looking for the total monthly expenditure each month, no need to break it down by subcatgories (e.g., labor, equipment, etc), a simple report is fine. For example:

Cost
Total funding received: XXXX
Monthly Expenditure: XXXX
Funds Remaining: XXXX

Hope this helps.

Thanks,
(b)(6)
-----Original Message-----
From: (b)(6)
Sent: Monday, September 20, 2021 2:30 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
Subject: [Non-DoD Source] Monthly report for HDTRA-121-100023

Dear (b)(6)

Find attached a preliminary monthly progress report for our project. As we have been hiring, our project cadence is just getting going. My finance department tells me we'll usually have everything together for previous month's costs three weeks or so into the next month, so that's not included in this initial report, but I wanted to check that this is the level of detail you want.

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(b)(6)

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(b)(6)
Principal Scientist, Computational Research

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@noamross < Caution-https://twitter.com/noamross > (twitter)

noamross.net < Caution-http://noamross.net >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

From: (b)(6)
To:
Cc: (b)(6)
Subject: RE: [Non-DoD Source] New DTRA Grant check-in
Date: Wednesday, June 16, 2021 11:18:00 AM

Thanks for your ping (b)(6)

We received information from contracting that the funding documents are being prepared - so we are moving things along. Apologies for the duration and thanks for your patience. We will let you know once we receive word that the funds have been routed.

Thanks,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate (RD)
Chemical and Biological Technologies Department, Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)

NIPR:
SIPR:

-----Original Message-----
From: (b)(6)
Sent: Wednesday, June 16, 2021 8:31 AM
To: (b)(6)
Cc: (b)(6)
Subject: [Non-DoD Source] New DTRA Grant check-in

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I am just writing with my regular check-in on the status of our grant, "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning." Please let us know if there have been any developments.

Thank you,

(b)(6)

On Tue, May 18, 2021, 7:43 AM (b)(6)

Caution-mailto:(b)(6) rote:

Dear (b)(6)

I am writing to follow up again on the status of this grant, "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning." Please let us know if there have been any developments.

Thank you,

(b)(6)

---------- Forwarded message ---------
From: (b)(6)
Caution (b)(6) >
Date: Fri, Apr 16, 2021 at 2:36 PM
Subject: RE: [Non-DoD Source] Re: New DTRA Grant - Request for Information
To: (b)(6)
Cc: (b)(6)
Caution (b)(6)

Good Afternoon,

Nothing else is needed on your end. Funds have been committed on our and a PR package is in the approval process, so should be to you soon. Once funds have been received, we can schedule a kick-off meeting to do introductions and kick-start the effort. Looking forward to it and we will be in touch.

Thanks,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate
Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)
NIPR:
SIPR:

-----Original Message-----
From: (b)(6)
Sent: Friday, April 16, 2021 11:53 AM
To: (b)(6)
Caution
Cc
Caution
Subject: Re: [Non-DoD Source] Re: New DTRA Grant - Request for Information

Dear (b)(6)

I am writing to check on the status of this grant, "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning." Would you be able to tell us what the next steps are and when we should expect them? Please let me know if there's any information you need or if anything is waiting on a response from us.

Thanks,

(b)(6)

--

(b)(6)

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

(b)(6) (direct)
(fax)
(b)(6)
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Cau

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Tue, Mar 30, 2021 at 3:03 PM (b)(6)
(b)(6) < Caution-
Caution (b)(6) > >
wrote:

Thanks (b)(6)

Much appreciated. Hope to have funding to you shortly.

V/R

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate
Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTR (b)(6)
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Caution-mailto

-----Original Message-----
From: (b)(6)
Caution-Cautior
Sent: Tuesday, March 30, 2021 9:58 AM
To: (b)(6)
Caution-mail
< Caution-ma
Cc:
Caution-mail
Caution-mail
Subject: [Non-DoD Source] Re: New DTRA Grant - Request for Information

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

Thank you for following up. Our financial point of contact is:

(b)(6)
Caution-
Caution-
Caution-
(b)(6) (mobile)
(b)(6) (fax)

Our mailing address is:

EcoHealth Alliance
520 Eighth Avenue
Suite 1200

New York, NY 10018

Best,

(b)(6)

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-Caution-www.ecohealthalliance.org > > < Caution-Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > > >

Caution-
Caution-

(b)(6)

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Caution-

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Tue, Mar 30, 2021 at 8:55 AM (b)(6)

(b)(6) < Caution-

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< Caution-mail

(b)(6)

Good Morning (b)(6)

Just wanted to circle back on this to see if you are able to provide a Financial POC for the project and correlating contact information (email and phone), as well as the mailing address to be listed on the funding documents. We would like to ensure timely delivery of funds to you.

Looking forward to working together.

V/R

(b)(6)

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate
Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA: (b)(6)
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-----Original Message-----
From: (b)(6)
Sent: Wednesday, March 24, 2021 2:47 PM
(b)(6)
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<ross@e
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Caution-
Caution-
Cc: (b)(6)
Caution-mailto (b)(6)
Caution-mailto
Caution-mailto
Caution-mailto
Subject: New DTRA Grant - Request for Information

Good Afternoon (b)(6)

I am supporting the new grant on Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning that was awarded by our office to be managed by (b)(6). We are getting everything together to get funding out the and need some contact information to do so. Could you please provide the Financial POC for the project and correlating contact information (email and phone). Additionally, could you provide the mailing address to be listed on the funding documents as well.

Appreciate the information and looking forward to working with you and the EHA team.

Regards,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis

Defense Threat Reduction Agency

Research and Development Directorate

Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)

NIPR: (b)(6)

Caution-Caution-mailto (b)(6)

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Disclaimer

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From: (b)(6)
To: (b)(6)
Cc: (b)(6) (b)(6) (b)(6)
Subject: Re: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off
Date: Monday, August 16, 2021 11:29:20 AM

Dear (b)(6)

Here is the Zoom call-in information for tomorrow's meeting.

(b)(6)

Topic: EHA DTRA-ML Grant Kick-Off Meeting
Time: Aug 17, 2021 10:00 AM Eastern Time (US and Canada)

Join Zoom Meeting
Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 <
Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 >

Meeting ID: (b)(6)
Passcode: (b)(6)
One tap mobile
(b)(6) US (New York)
US (Washington DC)

Dial by your location
+1 646 558 8656 US (New York)
+1 301 715 8592 US (Washington DC)
+1 312 626 6799 US (Chicago)
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 669 900 6833 US (San Jose)
Meeting ID: (b)(6)
Passcode: (b)(6)
Find your local number: Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm <
Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm >

--

(b)(6)
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noamross.net < Caution-http://noamross.net >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Fri, Aug 13, 2021 at 12:08 PM (b)(6)
Caution-mailto:(b)(6) > wrote:

Hi (b)(6)

Thanks for following up. Could you please set up a Zoom conference link for Tuesday's kick off. Our virtual platform is limited to DoD users at this time, but hopefully that will change in the future...

As far as participants for Tuesday's kick off, it will only be (b)(6) from the DTRA (b)(6) side for the meeting, now that the grant was awarded, we no longer need a grant officer present.

Please let us know if you have any other questions. Look forward to Tuesday's meeting.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

NIPR (b)(6)

SIPR

From: (b)(6)
Sent: Friday, August 13, 2021 11:51 AM
To: (b)(6)
Caution-mailto: (b)(6)
Cc: (b)(6)
(b)(6)
Caution-mailto: (b)(6) > > (b)(6)
Caution-mailto: (b)(6)
Subject: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

We are looking forward to this meeting next Tuesday. Do you have a conferencing system you use, or would you like us to set up a Zoom meeting? Also, can you tell us who will be attending?

Best,

(b)(6)

Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
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C

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Mon, Aug 2, 2021 at 12:29 PM (b)(6)
Caution-Caution-mailto (b)(6)
Caution-mailto: (b)(6)
mailt (b)(6) > > > wrote:

All,

This grant kick off meeting is an opportunity for our team to review the proposed approach and deliverables for the base period tasks as outlined in the SOW, discuss programmatic expectations (reporting requirements, deliverables), and address any outstanding issues/questions prior to initiating the R&D effort (See draft agenda below).

1000-1030: EcoHealth Alliance Briefing (PPT format is preferred)

1030-1100: Open Discussion (All)

Please forward to any other team members you would like in attendance for this initial meeting.

We look forward to officially starting this effort!

Thanks,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W) (b)(6)

NIPR (b)(6)
Caution-mailto

SIPR
Caution-mailto

Disclaimer

From: (b)(6)
To: (b)(6)
Cc: (b)(6) (b)(6)
Subject: RE: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off
Date: Friday, August 13, 2021 12:07:00 PM

H(b)(6)

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V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W)(b)(6)

NIP

SIPR

From: (b)(6)
Sent: Friday, August 13, 2021 11:51 AM
To: (b)(6)
Cc: (b)(6) (b)(6)
(b)(6) ; (b)(6)
Subject: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

---

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(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

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Caution-mailto:(b)(6)
mailto:(b)(6) > > wrote:

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(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W) (b)(6)

NIP
Caution-

SIP
Caution-

From: (b)(6)
To:
Cc:

Subject: RE: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off
Date: Monday, August 16, 2021 11:35:00 AM

Received, thanks (b)(6)

"See" you tomorrow.

V/r,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, August 16, 2021 11:29 AM
To: (b)(6)
Cc: (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

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(b)(6)

Topic: EHA DTRA-ML Grant Kick-Off Meeting
Time: Aug 17, 2021 10:00 AM Eastern Time (US and Canada)

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Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 >

Meeting ID: (b)(6)
Passcode: (b)(6)
One tap mobile
(b)(6) US (New York)
US (Washington DC)

Dial by your location
+1 646 558 8656 US (New York)
+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 669 900 6833 US (San Jose)
Meeting ID: (b)(6)
Passcode: (b)(6)
Find your local number: Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm <
Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm >

--

(b)(6)
Principal Scientist, Computational Research

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520 Eighth Avenue, Suite 1200
New York, NY 10018

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+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Fri, Aug 13, 2021 at 12:08 PM (b)(6)
Caution-mailto (b)(6) > wrote:

Hi Noam,

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V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W) (b)(6)

NIP

SIP

From: (b)(6)
Sent: Friday, August 13, 2021 11:51 AM
To: (b)(6)
Caution-
Cc:
Delaveri
Caution-
Caution-
Subject: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

---

Dear (b)(6)

We are looking forward to this meeting next Tuesday. Do you have a conferencing system you use, or would you like us to set up a Zoom meeting? Also, can you tell us who will be attending?

Best,

(b)(6)
Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)
(twi

Cau

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Mon, Aug 2, 2021 at 12:29 PM (b)(6)
Caution-Caution-mailto (b)(6)
Caution-mailto (b)(6)
mailto (b)(6) > > wrote:

All,

This grant kick off meeting is an opportunity for our team to review the proposed approach and deliverables for the base period tasks as outlined in the SOW, discuss programmatic expectations (reporting requirements, deliverables), and address any outstanding issues/questions prior to initiating the R&D effort (See draft agenda below).

1000-1030: EcoHealth Alliance Briefing (PPT format is preferred)

1030-1100: Open Discussion (All)

Please forward to any other team members you would like in attendance for this initial meeting.

We look forward to officially starting this effort!

Thanks,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W (b)(6)

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Caution-mail

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From: (b)(6)
To: (b)(6)
Cc: (b)(6)
Subject: Re: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off
Date: Tuesday, August 17, 2021 11:48:32 AM
Attachments: 2021-08-17-EcoHealth-DTRA-project-kick-off.pptx

Dear (b)(6)

Thank you for the productive kick-off today. We are looking forward to getting started!

Find attached slides from today for your reference.

Best,

(b)(6)

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Mon, Aug 16, 2021 at 11:36 AM (b)(6)
Caution-mailto (b)(6) > wrote:

> Received, thanks (b)(6)

Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

(b)(6)

EcoHealth Alliance Project Kick-Off, 2021-08-17

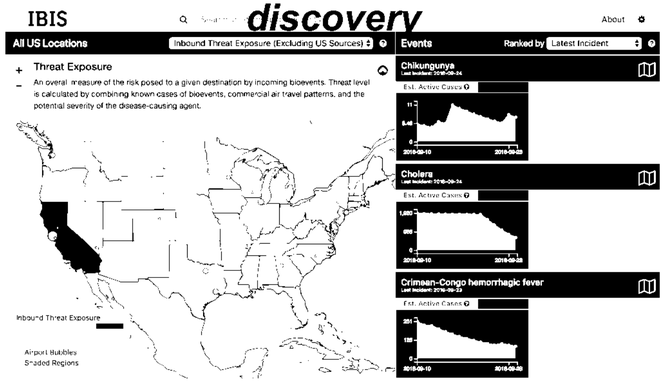
Agenda

- Presentation (<30 min)Introduction and TeamTechnical review: Data and AlgorithmsProject approach, management, and communicationDiscussion (~30 min)

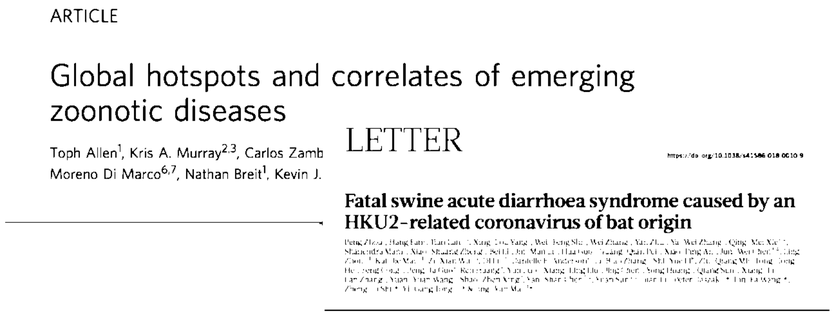
About EcoHealth Alliance

- Non-profit focused on research and prevention of emerging infectious diseaseHigh-impact field, lab, and analytical researchScience-informed policy advisory and tool developmentExtensive network of over 60 collaborating agencies and organizations, nationally and globally

Applied tool-building for diseasesurveillance and discovery



Policy advisory via a global network of partners


ARTICLE

Global hotspots and correlates of emerging zoonotic diseases

Toph Allen[1], Kris A. Murray[2,3], Carlos Zamb
Moreno Di Marco[6,7], Nathan Breit[1], Kevin J.

High-Impact Scientific Outputs

LETTER

https://doi.org/10.1038/s41586-018-0010-9

Fatal swine acute diarrhoea syndrome caused by an HKU2-related coronavirus of bat origin

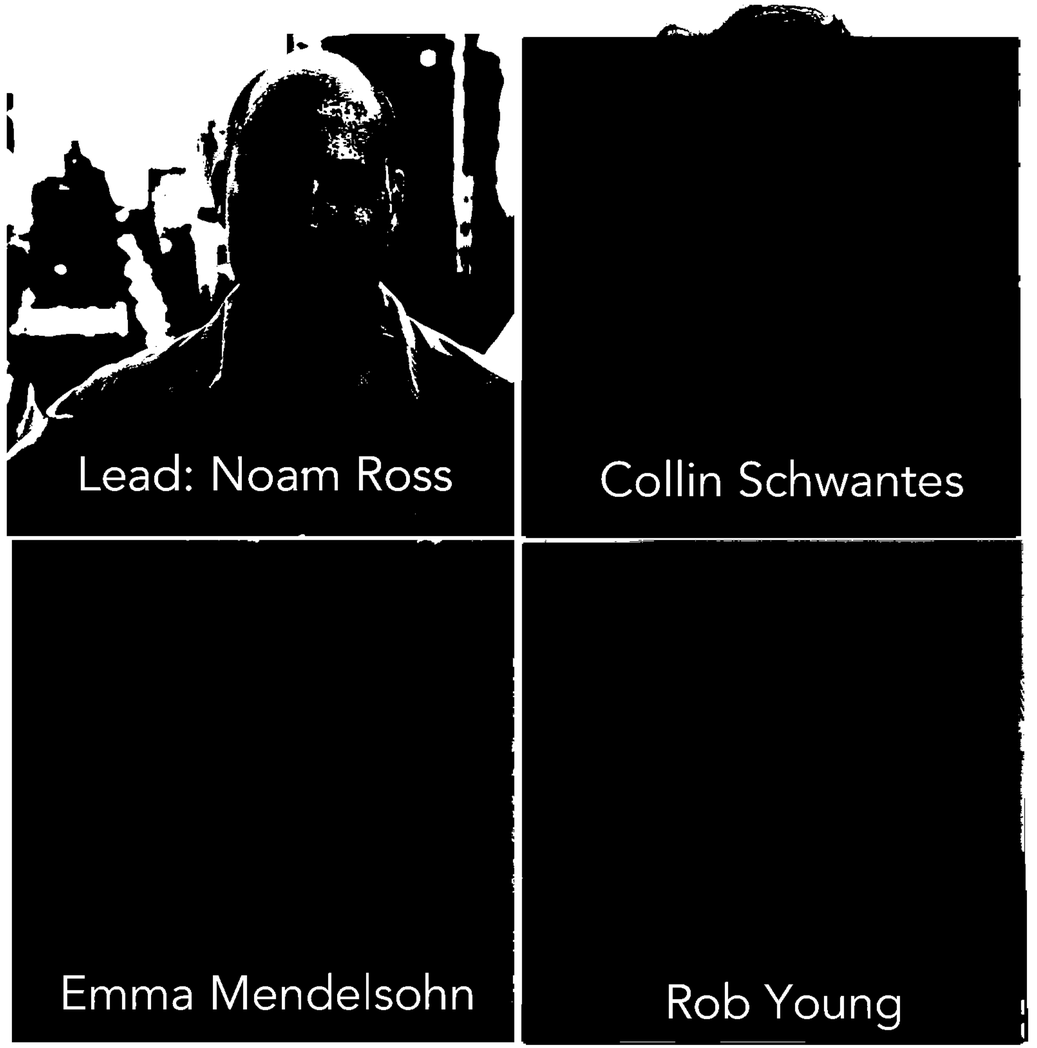

Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface

WORLD BANK GROUP

Global collaborations

The EHA Computational Sciences Team

- A machine-learning and computational epidemiology team within EHAComplements our applied and basic field and lab research, advisory, and partnershipsTight integration and collaboration with biological and behavioral teamsAdditional project oversight: Peter Daszak, William Karesh

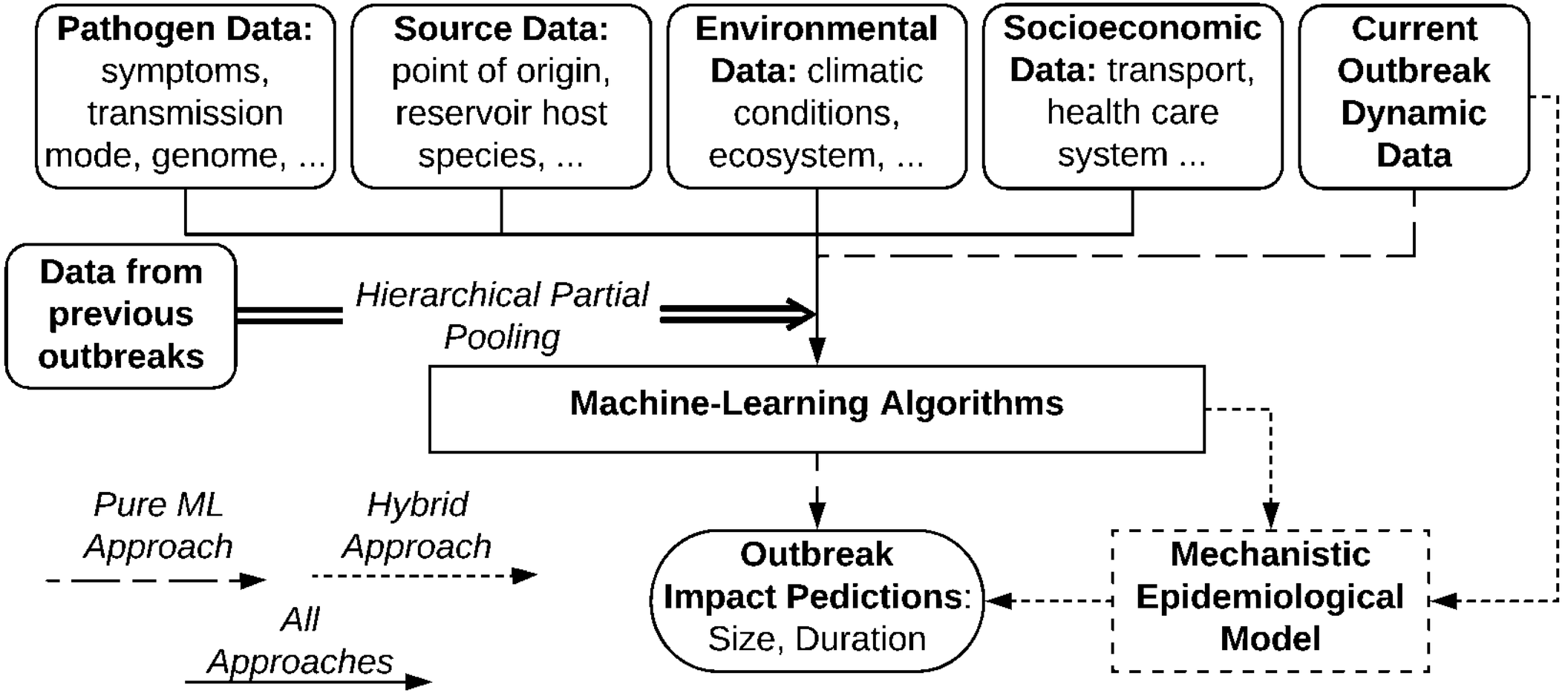


Technical Review: Core Questions

How well can we predict the course of disease outbreaks from data available at early stages?

Q1: Which early-stage data features are most predictive?Q2: How well well does partial pooling across different diseases improve predictions?

Modeling Approach

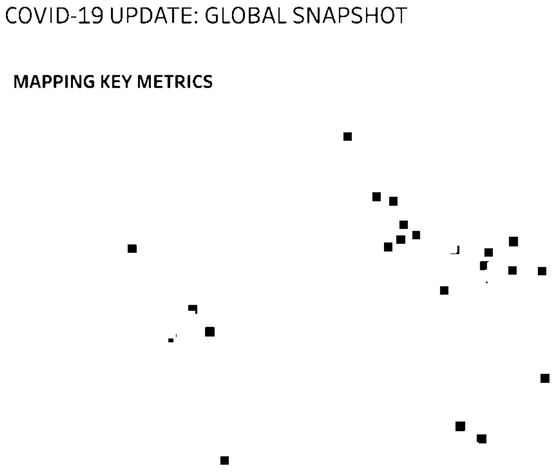


Data Sources: Longitudinal Outbreaks

Epidemiological data limitations are the largest barrier to applying new forecasting methods. We aggregate a variety of applicable sources

Previous DTRA Investments

Veterinary Data

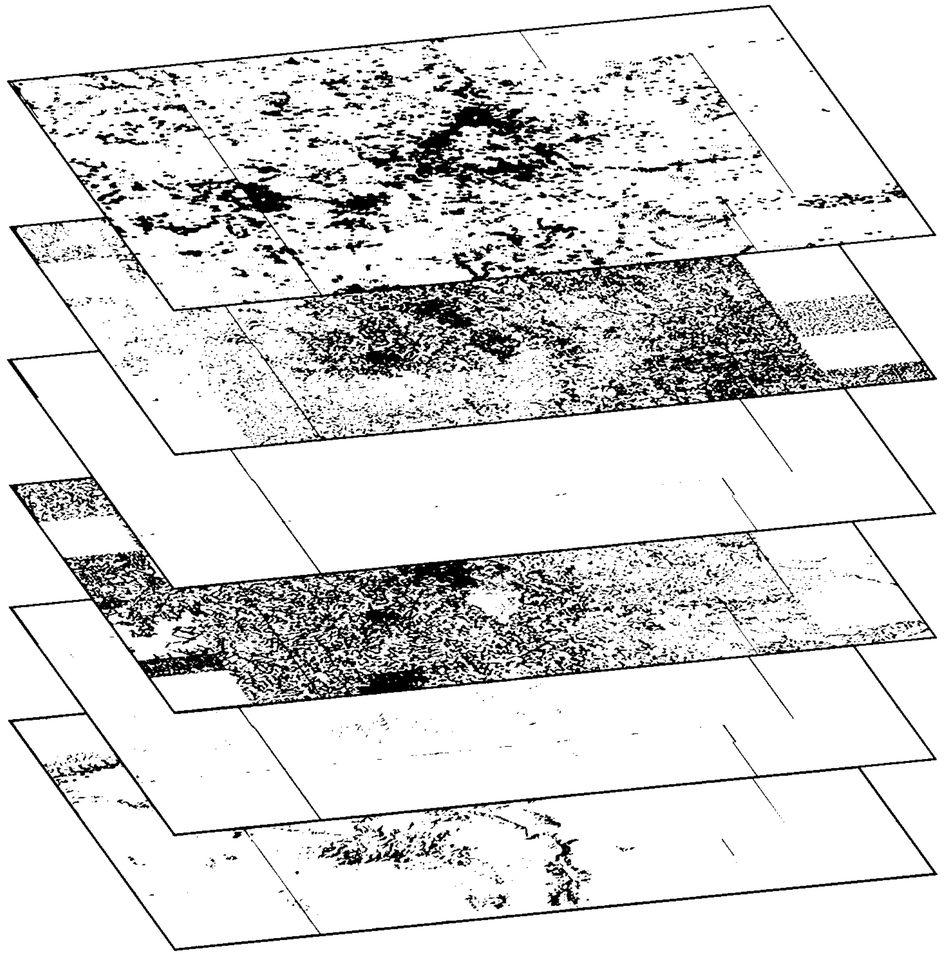


New COVID-19 Datasets

EHA's Data Repository

Data Sources: Outbreak Conditions

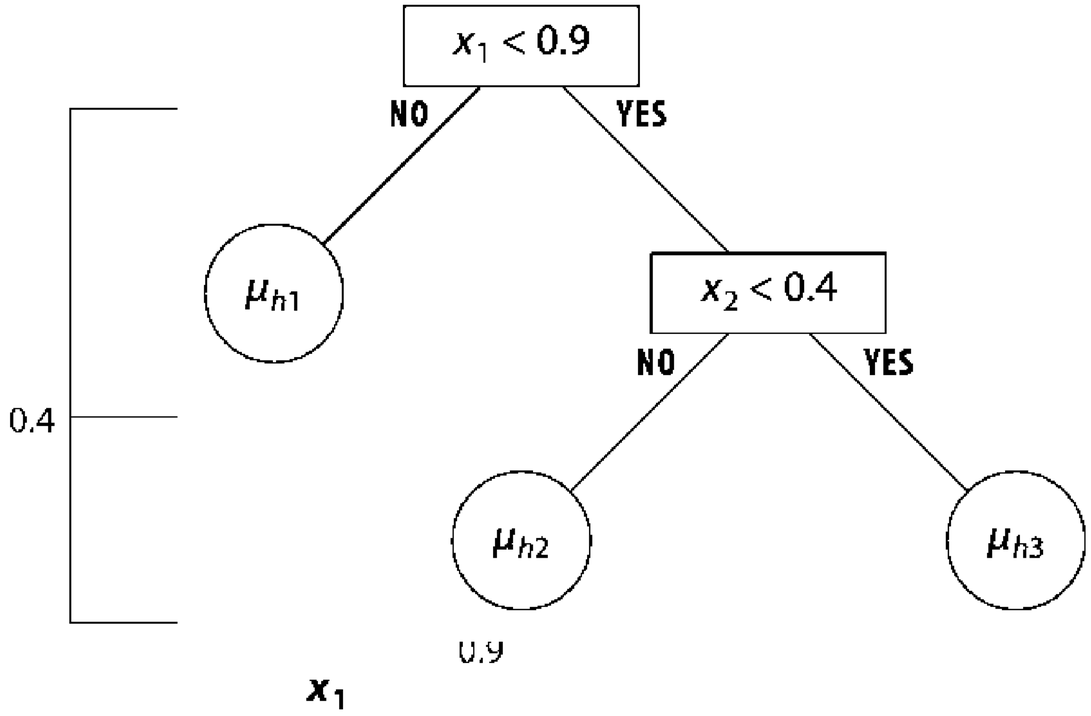
- Environmental data layersDisease host source and distributionHuman population, infrastructure, and transport layersResource availability and response capacityPathogen traits, transmission modes, disease etiology



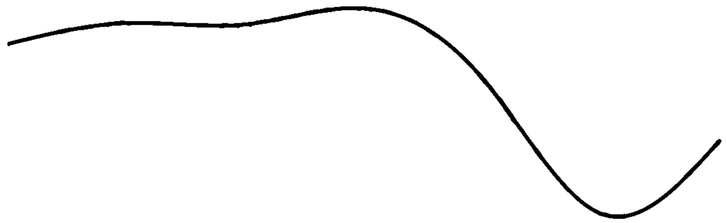
Algorithms: Two General Approaches with a Common Bayesian Twist

We use and compare two general approaches with different strengths

Regression Trees

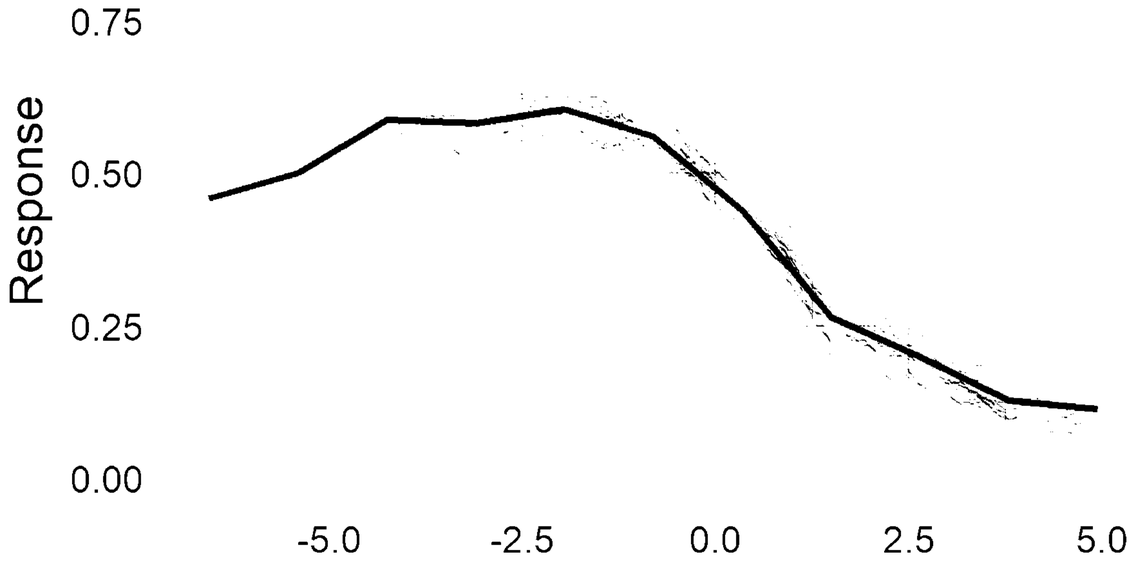


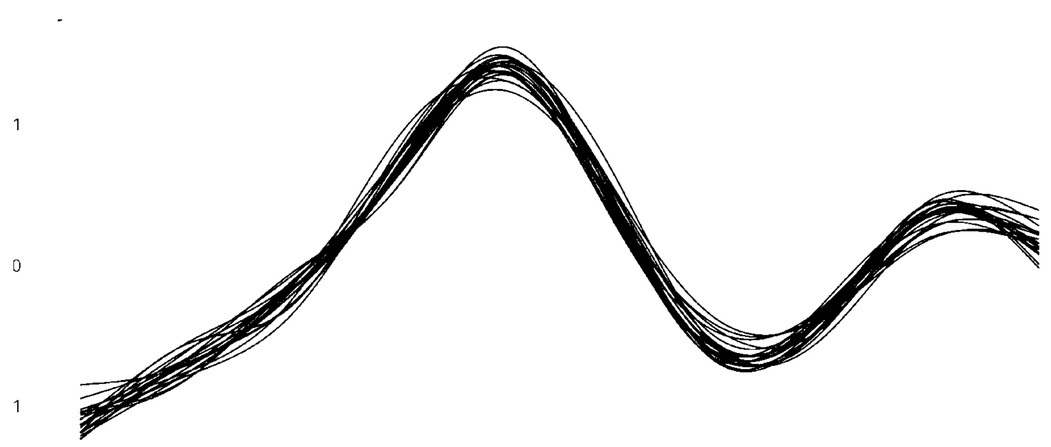
Additive Splines



Algorithms: Two General Approaches with a Common Bayesian Twist

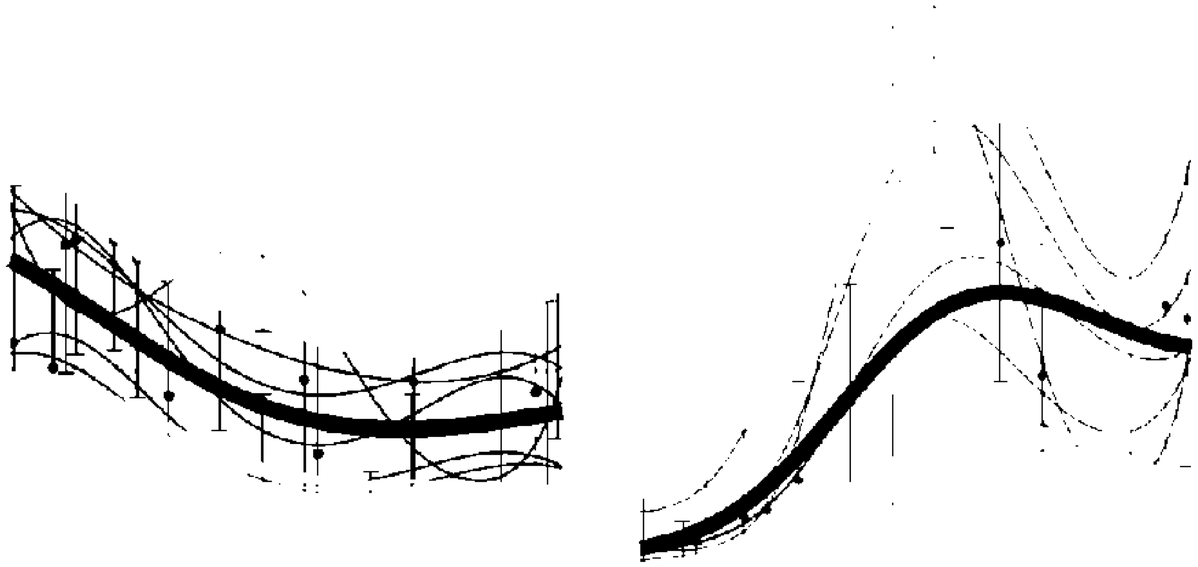
For both trees and splines, we use a Bayesian approach that provides a range of possible relationships, quantifying uncertainty in predictions





Algorithms: Partial Pooling

Partial Pooling allows us to capture relationships that are shared across diseases while letting the data guide how much information and transfer



Year 2 Options: Mechanistic Models, Genomic Data, Interactivity

Q3: How do hybrid machine-learning / mechanistic models compare to pure models in performanceQ4: Can genomic data improve early-stage outcome predictions?T1: Build an interactive interface to generate forecasts

Approach: Deployment-Ready R&D

- Principled validation approachesPractical, real-world performance baselinesDifferential privacy-based hold out testingDesign for rapid applicationR&D in portable computing containersRelease-ready data and models with APIs

Project Work Plan

	Year 1 S1	Year 1 S2
Data and Infrastructure Engineering	Database design and population, feature engineering	Refinement and linking
Algorithm Development	Performance metric design	Core model development
Interface Development		Static performance reports

Iteration, documentation, and reporting

Detail: SOW P. 7

Reporting and Deliverables

- Monthly status reports and cost statementsSemi-annual milestonesAnnual technical reportsSource code and project databasesPublications and conference papers

"See" you tomorrow.

V/r,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, August 16, 2021 11:29 AM
To: (b)(6)
Caution-
Cc: (b)(6)
(b)(6)
Caution-mailto (b)(6) >; (b)(6)
Caution (b)(6)
Caution
Caution
Caution
Subject: Re: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

Here is the Zoom call-in information for tomorrow's meeting.

(b)(6)

Topic: EHA DTRA-ML Grant Kick-Off Meeting
Time: Aug 17, 2021 10:00 AM Eastern Time (US and Canada)

Join Zoom Meeting
Caution-Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 < Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 > < Caution-Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 < Caution-https://ecohealthalliance-org.zoom.us/j/91998066276?pwd=UGh3dHgvZXBXNlZibWxqUEluZkk5UT09 > >

Meeting ID: (b)(6)
Passcode: (b)(6)
One tap mobile
(b)(6) US (New York)
US (Washington DC)

Dial by your location
+1 646 558 8656 US (New York)
+1 301 715 8592 US (Washington DC)
+1 312 626 6799 US (Chicago)
+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)
+1 669 900 6833 US (San Jose)
Meeting ID: (b)(6)
Passcode (b)(6)
Find your local number: Caution-Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm < Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm > < Caution-Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm < Caution-https://ecohealthalliance-org.zoom.us/u/a4YO61wsm > >

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(b)(6)

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

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(b)(6)

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Ca

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Fri, Aug 13, 2021 at 12:08 PM (b)(6)
Caution-mailto (b)(6)
Caution-mailto

Hi (b)(6)

Thanks for following up. Could you please set up a Zoom conference link for Tuesday's kick off. Our virtual platform is limited to DoD users at this time, but hopefully that will change in the future...

As far as participants for Tuesday's kick off, it will only be (b)(6) side for the meeting, now that the grant was awarded, we no longer need a grant officer present.

Please let us know if you have any other questions. Look forward to Tuesday's meeting.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W(b)(6)

NIP
Caution-mail

SIP
Caution-mail

From:(b)(6)
Caution-Cautio
Sent: Friday, August 13, 2021 11:51 AM
To: Batni, Sweta R CIV DTRA RD (USA) <sweta.r.batni.civ@mail.mil <
Caution-mailto(b)(6)
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Caution-mailto:(b)(6)
Caution-mailto:

Subject: [Non-DoD Source] Re: EcoHealth Alliance Grant Kick Off

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

We are looking forward to this meeting next Tuesday. Do you have a conferencing system you use, or would you like us to set up a Zoom meeting? Also, can you tell us who will be attending?

Best,

(b)(6)

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

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EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Mon, Aug 2, 2021 at 12:29 PM (b)(6)
Caution-mailto (b)(6)
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Caution-mailto

All,

This grant kick off meeting is an opportunity for our team to review the proposed approach and deliverables for the base period tasks as outlined in the SOW, discuss programmatic expectations (reporting requirements, deliverables), and address any outstanding issues/questions prior to initiating the R&D effort (See draft agenda below).

1000-1030: EcoHealth Alliance Briefing (PPT format is preferred)

1030-1100: Open Discussion (All)

Please forward to any other team members you would like in attendance for this initial meeting.

We look forward to officially starting this effort!

Thanks,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

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From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award
Date: Tuesday, March 2, 2021 10:17:57 AM

Received, thanks (b)(6) We don't have any further questions so will proceed with initiating the paperwork for a full award.

Look forward to officially kicking off this effort in the near term, will be in touch once awarded to schedule a grant kick off meeting.

Please let me know if you have any questions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Friday, February 26, 2021 3:07 PM
To: (b)(6)
Cc: (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

Find attached our updated Scope of Work and budget, now in your template. We have made the changes we discussed in our last meeting. The budget now includes both an option year as well as another option task for a model GUI. Note also that some labor costs have been adjusted due to salary changes from our annual review process which occurred since our original submission.

Best,
(b)(6)
Principal Scientist, Computational Research

I am on part-time medical leave, working reduced hours for Jan-Feb 2021, and may take longer than expected to respond to emails. Stay well.

EcoHealth Alliance
520 Eighth Avenue, Suite 1200

New York, NY 10018

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+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Wed, Feb 10, 2021 at 12:34 PM (b)(6)
Caution-mailto: (b)(6) wrote:

Sounds good, thanks Noam and team!

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, February 10, 2021 12:00 PM
To: (b)(6)
Caution-
Cc: (b)(6)
Caution-
Caution-
Caution-
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

---

Thank you (b)(6) we'll work on this and get it back to you next week.

Best,
(b)(6)

--

On Tue, Feb 9, 2021 at 3:59 PM (b)(6)
Caution-mailto (b)(6)
Caution-mailto

(b)(6)

Great talking with you earlier today and excited to kick off this effort with you in the near future.

As discussed attached is the latest version of the SOW with some changes/requested edits that we discussed this morning. Apologies some of the formatting got messed up when I was trying to clean it up so please feel free to edit the formatting as necessary prior to sending back the revised version.

I have also attached a copy of the cost template for your use in preparing a revised cost estimate once we have finalized the SOW.

Please let me know if you have any questions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Caution-Caution
Sent: Monday, February 8, 2021 12:43 PM
To: (b)(6)
Caution-mail
Caution-mail
Cc: (b)(6)
Caution-mail
Caution-mail
(b)(6)
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I am looking forward to our meeting tomorrow. I have attached my initial comments on the redlined SOW for us to discuss then.

Best,
(b)(6)
Principal Scientist, Computational Research

I am on part-time medical leave, working reduced hours for Jan-Feb 2021, and may take longer than expected to respond to emails. Stay well.

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

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(b)(6)
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EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Tue, Jan 26, 2021 at 9:55 AM (b)(6)
Caution-mailto (b)(6)
Caution-mailto
Caution-mailto
Caution-mailto

(b)(6)

Great, thanks for your flexibility. Let's plan on Tuesday 09 February from 1000-1100, I just sent you a calendar invite with MS Teams information please share with any relevant personnel from EcoHealth Alliance.

Looking forward to the discussions.

Thanks,

(b)(6)

-----Original Message-----
From: (b)(6)
Caution-Cau (b)(6)
Caution-Cau
Caution-mail
Sent: Monday, January 25, 2021 12:18 PM
To: (b)(6)
Caution-mailto (b)(6)
Caution-mailto
Caution-mailto
Caution-mailto
Cc: (b)(6)
Caution-mailto (b)(6)
Caution-mailto

(b)(6)

Subject: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

This is great to hear, thank you! Either February 8th or 9th at 10-11AM EST works for me. I will review your modifications to the SOW and be prepared to discuss them.

I look forward to working with you.

Best,

(b)(6)

Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

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+1.212.380.4465 (fax)
(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Thu, Jan 21, 2021 at 8:39 AM (b)(6)

(b)(6)

(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6) and (b)(6) (b)(6) I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

DTRA CB is still awaiting receipt of the remaining FY21 funds Congress has appropriated, however, prior to award and kick off of this effort, we can work collaboratively to finalize the SOW and cost negotiations so we are on track to kick off this grant award in the first quarter of this calendar year. To that end, I have attached a red lined SOW that has DTRA requested changes for the proposed effort. Please review so we can discuss next steps. During these follow on discussions, please be prepared to discuss any questions, concerns, and associated cost, schedule, and contract changes that may need to be completed to address the requested changes.

The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday

February 9th from 1000-1100 work for your team?

Look forward to working with you.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(W(b)(6)

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From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award
Date: Wednesday, February 10, 2021 12:26:02 PM

Sounds good, thanks (b)(6) nd team!

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, February 10, 2021 12:00 PM
To: (b)(6)
Cc: (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

---

Thank you (b)(6) we'll work on this and get it back to you next week.

Best,
(b)(6)

--

On Tue, Feb 9, 2021 at 3:59 PM (b)(6)
Caution-mailto (b)(6) > wrote:

(b)(6)

Great talking with you earlier today and excited to kick off this effort with you in the near future.

As discussed attached is the latest version of the SOW with some changes/requested edits that we discussed this morning. Apologies some of the formatting got messed up when I was trying to clean it up so please feel free to edit the formatting as necessary prior to sending back the revised version.

I have also attached a copy of the cost template for your use in preparing a revised cost estimate once we have finalized the SOW.

Please let me know if you have any questions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)

Sent: Monday, February 8, 2021 12:43 PM
To: (b)(6)
Caution-
Cc: (b)(6)
Caution-
Caution-
Caution-
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

I am looking forward to our meeting tomorrow. I have attached my initial comments on the redlined SOW for us to discuss then.

Best,

(b)(6)

Principal Scientist, Computational Research

I am on part-time medical leave, working reduced hours for Jan-Feb 2021, and may take longer than expected to respond to emails. Stay well.

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)
(t
C

On Tue, Jan 26, 2021 at 9:55 AM (b)(6)

Caution (b)(6)

Caution

(b)(6)

Great, thanks for your flexibility. Let's plan on Tuesday 09 February from 1000-1100, I just sent you a calendar invite with MS Teams information please share with any relevant personnel from EcoHealth Alliance.

Looking forward to the discussions.

Thanks,

(b)(6)

-----Original Message-----

From: (b)(6)

Caution-Caution

Sent: Monday, January 25, 2021 12:18 PM

To: (b)(6) (b)(6)

Caution (b)(6)

Caution

(b)(6)

Subject: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

This is great to hear, thank you! Either February 8th or 9th at 10-11AM EST works for me. I will review your modifications to the SOW and be prepared to discuss them.

I look forward to working with you.

Best,

(b)(6)

Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

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+1.212.380.4465 (fax)
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EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Thu, Jan 21, 2021 at 8:39 AM (b)(6)
Caution-mailto (b)(6)
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Caution-mailto
Caution-mailto
(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6)
(b)(6) I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

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The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday February 9th from 1000-1100 work for your team?

Look forward to working with you.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

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> < Caution-Caution-n
> >

From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award
Date: Tuesday, February 9, 2021 3:58:41 PM
Attachments: EHA_Statement of Work_v4.docx
ATTACHMENT 5 - Cost Proposal Template.xlsx

(b)(6)

Great talking with you earlier today and excited to kick off this effort with you in the near future.

As discussed attached is the latest version of the SOW with some changes/requested edits that we discussed this morning. Apologies some of the formatting got messed up when I was trying to clean it up so please feel free to edit the formatting as necessary prior to sending back the revised version.

I have also attached a copy of the cost template for your use in preparing a revised cost estimate once we have finalized the SOW.

Please let me know if you have any questions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, February 8, 2021 12:43 PM
To: (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

---

Dear (b)(6)

I am looking forward to our meeting tomorrow. I have attached my initial comments on the redlined SOW for us to discuss then.

Best,
(b)(6)
Principal Scientist, Computational Research

I am on part-time medical leave, working reduced hours for Jan-Feb 2021, and may take longer than expected to

Attachment 1 - Statement of Work (SOW)
Project Title: Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning
Document Date: February 9, 2021

Objective
The project's objectives are to determine the efficacy of machine learning (ML) techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats, both intentional (e.g. novel genetically-modified pathogens) and natural (e.g. zoonotic). Specifically, we will answer three questions that will enable rapid decision-making based on ML models of epidemic impacts:

Q1: How much does partial-pooling improve predictions of epidemic impacts, and what information transfers best across diseases?
Q2: What variables are most predictive of epidemic impacts at early stages of an outbreak?
Q3: At what point in epidemic growth do hybrid models that incorporate mechanistic epidemiological components become more accurate than pure ML models?

This work will contribute to fundamental knowledge of properties and variables that contribute most to predictive accuracy at early-stage stages in emerging outbreak prediction and forecasting. It will enable the development of robust and deployable predictive models at early stages of outbreaks, and support informed choices for data collection and model selection.

Scope
The awardee proposes a two-year study to determine the efficacy of ML techniques in predicting epidemic impacts in early-stage, data-sparse conditions, particularly novel biothreats. The awardee team shall focus on the following major goals and milestones:

- *Year 1, Milestone 1 (6 months)*: Create and curate predictor database, project infrastructure, continuous integration/validation, establish data-imputation and automatic predictor workflow (Tasks 1.1-1.2).
- *Year 1, Milestone 2 (12 months)*: Bayesian additive regression tree (BART) model fitting and tuning, determination of variable contribution to prediction accuracy (Task 1.3).
- ~~*Option* Year 1~~, *Milestone 3 (12~~8~~ months)*: Maintain and document project infrastructure,
- *Option Year 1, Milestone 4 (18 months)*: Extend the database to include additional predictors, extend the BART model to ingest genetic data (Tasks 2.1-2.3)
- *Option Year, Milestone 54* (24 months): Construction of hybrid ML/mechanistic model structure, comparative testing of pure and hybrid version, determination of timing when current data overtakes transfer data (Task 2.4)

Background
Situational awareness and risk assessment are critical at early stages of disease outbreaks, when interventions can best mitigate adverse outcomes. Yet decision-makers often face a paucity of data at these stages. Traditional modeling methods to forecast disease impact severity rely heavily on prior knowledge or assumptions about mechanisms of disease spread progression, and they frequently do not anticipate the actual mechanisms.[1-5] They also take considerable time and effort to develop.

Commented [BSC1]: By early stage do you mean prior to an epidemic being defined as an epidemic i.e., The ML algorithm will be able to detect a spike in initial few case counts above baseline and then forecast outcomes or do you intend for the ML algorithm to forecast impacts once an epidemic has been declared then forecasting outcomes in the early stages of an epidemic? Ideally it is the former, as that would address the capability gap of "preparing for surprise." Please clarify.

Commented [NR2R2]: By "early stage" we mean when time-series of case counts are short and the epidemic is not yet in a period of rapid exponential growth. Because of the focus on novel biothreats, either new pathogens or pathogens in novel contexts, we do not expect to have data on previous case counts of previous long-running or low-level endemic disease. Thus, we do not anticipate the algorithm detecting a break point from previous endemic disease, but to estimate impacts from the first few weeks of data from a new outbreak, declared as an epidemic or not. This is more like the latter.

A changepoint detection algorithm is an additional task we could discuss including in optional or future work. It could pair with this model to automatically estimate impacts of diseases that appear to be diverging from baseline endemic levels.

Commented [BSC3R2]: The changepoint detection algorithm is out of scope for this SOW, table discussion for this effort, revisit in future if appropriate.

Commented [BSC4]: DTRA is in agreement with your strategic vision and definition of "early stage" you proposed above. Please add generalizable language in the objective to clarify what "early stage" is meant specific to this effort.

Commented [BSC5]: Add a bullet to add optional task to the scope. Agreed timing should be ~6 months into the option period 1 of the effort. Provide revised GANTT chart including optional task and whether in parallel or sequential with other tasks.

Recent theory suggests disease dynamics are fundamentally predictable[4], and ML methods have been successfully applied in emerging disease science. ML refers to a group of methods, ranging from simple nearest-neighbor approaches to function-approximation methods such as boosted trees and penalized splines, to complex deep-learning neural networks. ML has been used to predict the likelihood of disease emergence and the zoonotic potential of various hosts and viruses[5,6], and deep-learning approaches have been used to infer viral hosts from the comparatively richer data of genetic sequences of viruses.[7,8]

ML methods are generally unstructured, flexible, and offer greater predictive power over traditional statistical approaches. However, these methods are data-intensive, and a key challenge with ML development is data paucity and/or a low signal-to-noise ratio. Surveillance data for even existing, well-studied diseases is rarely rich enough for the data scale of many modern ML techniques. For instance, a ML approach to predict impacts from a new outbreak of Ebola would draw training data from fewer than twenty previous events, each with varying levels of data coverage.

Transfer learning, or data fusion, provides a solution to data paucity issues by using data from other domains to train parts of models that are general, thus limiting new data requirements for more specific components. Hierarchical modeling, or *partial pooling*, is a transfer learning approach for partitioning out which data can be shared between models and which are only applicable to a specific case. For instance, Ebola forecasts for countries outside the historic range of the disease may be improved by calibrating against Cholera outbreaks, which have occurred both within and outside countries with Ebola outbreaks. The degree to which the disease outcomes are correlated is learned, rather than assumed.

An alternative recent development in disease forecasting is the development of hybrid models that incorporate simple mechanistic structures and predictive ML methods to learn model parameters. These approaches have demonstrated high predictive accuracy for near-term forecasting of epidemic growth and impact, particularly during the COVID-19 pandemic[9]. However, these approaches require adequate time-series of data to project forward from current conditions. Their utility in early stages and long-term forecasting accuracy has yet to be determined. In opting to apply these models, it is critical to understand these data requirements and at what point in an outbreak hybrid approaches can overtake pure ML early-stage predictions in accuracy. This project seeks to develop, apply, and compare pure and hybrid-ML techniques to enable the development of robust, rapidly usable predictions at early stages of outbreaks.

Key references (additional references can be found in the Technical Proposal):

1 MacDiarmid, S. C. *et al. Handbook On Import Risk Analysis for animals and animal products: quantitative risk assessment*. Vol. 2 (Office International des Épizooties, 2004).
2 Moura, J. A., McManus, C. M., Bernal, F. E. M. & de Melo, C. B. An analysis of the 1978 African swine fever outbreak in Brazil and its eradication. *Rev. Sci. Tech.* **29**, 549-563, doi:10.20506/rst.29.3.1992 (2010).
3 Delgado, J. *et al.* U.K. Foot and Mouth Disease: A Systemic Risk Assessment of Existing Controls. *Risk Anal.* **37**, 1768-1782, doi:10.1111/risa.12704 (2017).

4 Scarpino, S. V. & Petri, G. On the predictability of infectious disease outbreaks. *Nat. Commun.* **10**, 898, doi:10.1038/s41467-019-08616-0 (2019).
5 Olival, K. J. *et al.* Host and viral traits predict zoonotic spillover from mammals. *Nature*, doi:10.1038/nature22975 (2017).
6 Allen, T. *et al.* Global hotspots and correlates of emerging zoonotic diseases. *Nat. Commun.* **8**, 1124, doi:10.1038/s41467-017-00923-8 (2017).
7 Mock, F., Viehweger, A., Barth, E. & Marz, M. VIDHOP, viral host prediction with Deep Learning. *Bioinformatics* (2019).
8 Babayan, S. A., Orton, R. J. & Streicker, D. G. Predicting reservoir hosts and arthropod vectors from evolutionary signatures in RNA virus genomes. *Science* **362**, 577-580, doi:10.1126/science.aap9072 (2018).
9 Gu, Y. *COVID-19 Projections Using Machine Learning*, <https://covid19-projections.com/about/#historical-performance> (2020).

Data Sources

Fitting and testing models will draw from disease outbreak data (counts, timing, and geography) and predictor data including pathogen traits (disease symptoms, pathogen traits, modes of transmission), pathogen sources (point of origin, geographic range of potential natural hosts), environmental context (climatic conditions, ecosystem traits), and socioeconomic context (local population densities, demographics, transportation networks, healthcare systems). Please see the Technical Proposal for available data sources.

Tasks/Scientific Goals (Format: Year.Task.Subtask)

YEAR 1

Task 1.1 – Develop and deploy project infrastructure

The awardee shall develop a computational environment that enables continuous model development and testing and allows for research and models to be reproduced and extended by external teams. The computational environment will include continuous maintenance and documentation of project codebase.

Subtasks

1.1.1 Layout a provision project network
1.1.2 Set up continuous integration pipelines
1.1.3 Implement backup and data verification jobs
1.1.4 Implement differential privacy testing
1.1.5 Write and maintain codebase documentation
1.1.6 Perform code review, testing and validation

Task 1.2 – Engineer project database

The awardee shall curate, integrate, cross-link, and validate relevant datasets from various sources into a project database, accounting for differing space and time scales, data formats, and data completeness.

Subtasks

1.2.1 Design database schema
1.2.1 Write pipelines to ingest time-series data
1.2.2 Write pipelines to ingest predictor data
1.2.3 Cross-link data sources via common ontologies

1.2.4 Write quality assurance/quality control (QA/QC) tests for data and perform data cleaning
1.2.5 Create automatic extraction routines to populate relevant predictors from location information
1.2.6 Update data from live sources and clean and maintain data continuously

Task 1.3 – Machine Learning (ML) model development and testing
The awardee shall design, implement, test, and analyze performance of ML model structures and iteratively improv them.

Subtasks
1.3.1 Establish quantitative and qualitative metrics of model performance
1.3.2 Implement "practical naïve" model baseline
1.3.3 Design Bayesian additive regression tree (BART) model structure
1.3.4 Design alternative generalized additive model (GAM) structure
1.3.5 Implement within-disease, all-disease, and partial-pooled disease model versions
1.3.6 Measure variable contribution by re-fitting
1.3.7 Analyze prediction-level variable contributions and model performance
1.3.8 Iteratively update models to improve performance

Task 1.4—Maintain and document project infrastructure
The awardee shall document the methodology for database schema, data ingestion pipelines, QA/QC tests, extraction routes, and ML models established in Tasks 1.1-1.3.
Subtasks
1.4.1 Write and maintain initial codebase documentation
1.4.2 Perform code review, testing, and validation

Commented [BSC6]: Add the same task (i.e., Maintain and document project infrastructure) to Option Year (see below). Can note in Option Year that the task is a continuation of Task 1.4 above.

OPTION YEAR:

Task 2.1 – Extend project database
In the option year, the awardee shall extend the database to include additional predictors and continuously maintain and update to accumulate more data from upstream sources.

Subtasks
2.1.1 Extend database schema to include genetic data and auto-encoded variables
2.1.2 Write pipelines to ingest genetic data
2.1.3 Cross-link data sources via common ontologies
2.1.4Write QA/QC tests for data and perform data cleaning
2.1.5Update data from live sources and clean and maintain data continuously

Commented [BSC7]: Add the same task (i.e., Maintain and document project infrastructure) as Task 2.4 in Option Year. Can note in Option Year that the task is a continuation of Task 1.4 above.

Task 2.2 – Extend BART model
In the option year, the awardee shall extend the BART model to ingest genetic data and test the contribution of this data in enhancing or recapitulating pathogen trait data.

Subtasks
2.2.1Develop genetic predictor variable set via neural-network autoencoding
2.2.2 Modify BART and GAM structures to incorporate genetic variables
2.2.3 Implement within-disease, all-disease, and partial-pooled disease model versions
2.2.4 Compare performance of genetic, pathogen-trait, and combined models

Task 2.3 – Hybrid ML-mechanistic model development and testing

In the option year, the awardee shall develop the hybrid machine-learning mechanistic model, compare its performance to a pure ML model, and determine the switch-over time when the mechanistic model becomes more predictive in the course of the outbreak.

Subtasks

2.4.1 Establish quantitative and qualitative metrics of model performance
2.4.2 Design mechanistic model structure
2.4.3 Determine mechanistic model prior forms
2.4.4 Modify ML model to predict mechanistic parameters rather than outcomes
2.4.5 Implement within-disease, all-disease, and partial-pooled disease model versions
2.4.6 Measure variable contribution by re-fitting
2.4.7 Analyze prediction-level variable contributions and model performance using criteria developed in SubTasks 1.3.x
2.4.8 Compare Hybrid and ML performance along outbreak time-series progression
2.4.9 Iteratively update models to improve performance

OPTIONAL Task 2.5—Develop GUI of alpha prototype (Year 1)

The awardee shall develop an alpha prototype of an end user GUI of the hybrid machine-learning mechanistic model and pure ML model to include data visualizations to forecast one class of diseases (e.g., airborne person to person transmissible).

Deliverables

Reports and Documents

- Monthly reports on task status
- Monthly cost statement
- Periodic program reviews (virtual and/or in person)
- Annual technical report
- Source and executable software code
- Technical papers describing algorithm design and performance
- Conference presentations

Code Modules and Database Archives

~~All code modules and documentation will be continually available on EcoHealth Alliance's GitHub page with access provided to DTRA.~~ Databases will be made available for download and provided electronically via DoD SAFE and/or on-disk to DTRA at the end of the period of performance. .

Please note: The data and information collected in this effort is funded on the condition that it will not be released to another nation or international organization without the specific authority from the Defense Threat Reduction Agency. Individual or corporate rights originating in the information, whether
patented or not, will be respected; that the recipient government will report promptly to the Defense Threat Reduction Agency any known or suspected compromise and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States. No U.S. Government commitment to sell, lend, lease, co-develop, or co-produce defense articles is implied or intended. Also, regardless of any other markings on the document, it will not be downgraded
or declassified without written approval of the originating U.S. agency.

Commented [BSC8]: Expand this out more into subtasks, provide detail as to timing, and costs associated.

Commented [NR9]: This is a distinct new task from the original scope. Would it be possible to adjust the budget so that we can be sure to have adequate time and team members with the requisite skills for this?

Commented [BSC10R10]: Yes, in revised cost proposal please adjust budget accordingly to reflect additional resources to accomplish optional task.

Commented [BSC11]: The annual technical report shall include the following sections at a minimum:
Executive Summary
I.Introduction/Background
II. Methodology
III.Findings
IV.Discussion/Future Recommendations
V.Conclusion
VI.Appendices
a.Snapshots of GUI/how to use
b.Data worksheet (summarizing list of data sources used, metadata abstracted, links, etc.)
User specified format on report is acceptable.

Commented [BSC12]: Remove this sentence. All code modules and database archives will be cleared via DTRA OPSEC prior to release.

COST PROPOSAL

Prime 1 (Fill-in)

Sub 1 (Fill-in)

GENERAL INFORMATION

The purpose of the requested information in the attached worksheets is to assist government personnel in the review and evaluation of cost proposals submitted by offerors.

Options: Unpriced Options will not be accepted. Any Option that is not fully priced, will not be included in any resulting award.

Enter the proposed cost detail for the Base and each Option period (as needed) on the "Total Amount" tab.

- The formulas in this spreadsheet are based upon common business practices; however, Offerors may edit formulas as necessary (edited formulas must still be visible).
- Ensure all costs from other worksheets are correct.

Below is a summary of the proposed cost. This chart will automatically fill in from the "Total Amount" tab.

Total Direct Labor Costs	$0
Total Fringe Benefit Costs	$0
Total Labor Overhead Costs	$0
Total Subcontract Costs	$0
Total Consultant Costs	$0
Total Other Direct Costs	$0
Total Material Handling Costs	$0
Subtotal Costs	$0
Total G&A Costs	$0
Subtotal Costs	$0
Total Cost of Money	$0
Total Estimated Costs	$0
Fixed Fee (If proposing a CPFF contract)	$0
Total Estimated Costs Plus Fixed Fee	$0

Cost Proposal - Total Amount
Prime Offeror: Prime 1 (Fill-in)
Subcontractor: Sub 1 (Fill-in)

				BASE			OPTION 1			OPTION 2			OPTION 3			OPTION 4		Total	
Direct Labor (DL)				MM/YR to MM/YR			MM/YR to MM/YR			MM/YR to MM/YR			MM/YR to MM/YR			MM/YR to MM/YR			
	Offeror's Labor Category (Note 1)	Name (Last, First)	Base/Hours	Rate	Extended $	Base/Hours	Rate	Extended $	Base/Hours	Rate	Extended $	Base/Hours	Rate	Extended $	Base/Hours	Rate	Extended $	Base/Hours	Extended $
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
			0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00	$0.00	0	$0.00
	Total Direct Labor Costs		**0**	**$0.00**	**$0.00**	**0**	**$0.00**	**$0.00**	**0**	**$0.00**	**$0.00**	**0**	**$0.00**	**$0.00**	**0**	**$0.00**	**$0.00**	**0**	**$0.00**
Fringe Benefits (F/B) (See Escalation and Indirect Rate Worksheet)																			
	Insert F/B rate title		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
	Insert line(s) & title(s) for any other F/B rates		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00		$0.00
	Total Fringe Benefit Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Labor Overhead (O/H) (See Escalation and Indirect Rate Worksheet)																			
	Insert O/H rate title		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
	Insert line(s) & title(s) for any other O/H rates		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00		$0.00
	Total Labor Overhead Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Subcontracts/Interorganizational Transfer		File/Tab Name or Link																	
	Subcontract/Interorganizational Name - #01	*Provide details in Subcontractor Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Subcontract/Interorganizational Name - #02	*Provide details in Subcontractor Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Subcontract/Interorganizational Name - #03	*Provide details in Subcontractor Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Insert line(s) for any additional Subcontractors/Interorganizational	*Provide details in Subcontractor Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Total Subcontract Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Consultants																			
	Consultant Name - #01	*Provide details in Consultant Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Consultant Name - #02	*Provide details in Consultant Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Consultant Name - #03	*Provide details in Consultant Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Insert line(s) for any additional Consultants	*Provide details in Consultant Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Total Consultant Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Other Direct Costs																			
	Materials/Supplies	*Provide details in Materials Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Equipment	*Provide details in Equip. Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Travel	*Provide details in Travel Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Insert line(s) for any other types of ODCs	*Provide details in ODC Tab*			$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Total Other Direct Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Material Handling (M/H O/H) (See Escalation and Indirect Rate Worksheet)																			
	Insert M/H O/H rate title		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
	Insert line(s) & title(s) for any other M/H O/H rates		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00		$0.00
	Total Material Handling Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Subtotal Costs					**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
General and Administrative (G&A) (See Escalation and Indirect Rate Worksheet)																			
	Insert G&A rate title		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
	Insert line(s) & title(s) for any other G&A rates				$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Total G&A Costs				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Subtotal Costs					**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Facilities Cost of Money (COM) (See Escalation and Indirect Rate Worksheet)																			
	Insert COM rate title		$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
	Insert line(s) & title(s) for any other COM rates				$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
	Total Cost of Money				**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**
Total Estimated Costs					$0.00			$0.00			$0.00			$0.00			$0.00		$0.00
Fixed Fee (If proposing a CPFF contract)		(Note 2)	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0	0.000%	$0.00	$0.00	$0.00
Total Estimated Costs Plus Fixed Fee		(Note 3)			**$0.00**			**$0.00**			**$0.00**			**$0.00**			**$0.00**		**$0.00**

Instructions:
- For PRIME submission - Subcontractor Name: If there are subcontracts, list all subcontractor names.
- List Principal Investigator and Key Personnel working on the project even if they receive no salary support.
- Subcontracts/Interorganizational Transfers: If appropriate, place Subcontractor name(s) or Interorganizational Name/Code in Column B
- Consultants: If appropriate, place Consultant name(s) in Column B
- Remember that the total of all Base and Option worksheets should equal the total of the Total Amount worksheet.
- Add descriptions in Column B if costs are entered in the following areas: Fringe Benefits, Labor Overhead, Other Direct Costs/other types, Material Handling, General and Administrative, and Facilities Cost of Money

Note 1: **Any proposed personnel in the technical proposal should be identified with their labor category.**
Note 2: **Profit or fee is not allowed on direct costs for travel. In addition, a DD Form 1547 (DFARS 215.404-70) will be utilized in calculating the Government objective for fee.**
Note 3: **This worksheet does not pull data from other worksheets within this Excel Spreadsheet**

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LABOR Information Prime 1 (Fill-in)								
		Base Period	Option I	Option II	Option III	Option IV	Supporting Documentation	Supporting Rationale
Labor Category (Note 1)	Name	Direct Labor Rate	Escalation Rate	Escalation Rate	Escalation Rate	Escalation Rate	(Note 2)	(Note 3)

Indirect Rates								
	Base Period	Option I	Option II	Option III	Option IV	Basis of Rate	Applied Against (Note 5)	Supporting Documentation (Note 6)
Rate Category	Rate	Rate	Rate	Rate	Rate	(Example: FPRA, FPRP, Estimate, etc.)		
Fringe Benefits								
Labor Overhead								
Material Handling								
General and Administrative								
Facilities Cost of Money								

Note 1: Add additional labor categories if needed.
Note 2: Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) to support your price basis (e.g. copy of current payroll record or signed offer letter)
Note 3: Provide the location (section, page) in the proposal's Technical Basis of Estimate (BAA para 3.5.2.1.2) of the rationale for the appropriateness and necessity of the proposed labor categories and the labor hours alloc
Note 4: Add additional indirect rates as needed.

If the offeror does not have a Forward Pricing Rate Agreement (FPRA), Forward Pricing Rate Recommendation (FPRR), or provisional billing rates; in order to assist the Government in evaluating the reasonableness of your proposed indirect rates, please provide the following information:

1. Performance data used to develop your proposed indirect rates. This typically consists of pool costs and base costs that demonstrate how the indirect rates were derived.
2. Information regarding your projections for out years, including your assumptions and method for developing these estimates.

SUBCONTRACTOR COST DATA Prime 1 (Fill-in)

Subcontracts/Interorganizational Transfers – A fully disclosed cost proposal as detailed as the Offeror's cost proposal including support documentation In accordance with FAR 15.404-3(b) and 15.404-3(c), the prime contractor **shall** perform and provide a cost/price analysis of each subcontractor's cost

Certified cost or pricing data may be required for subcontractor proposals over $2,000,000.00, in accordance with Section 811 of the National Defense Authorization Act for Fiscal Year 2018 (Pub. L. 115-91).

Subcontractor	CAGE Code	Competitive/Sole Source	Cost/price analysis included (Y/N)	Type of Subcontract (i.e., Fixed Price, Time and Materials, etc.)	Competitive Quotes or Sole Source Documentation Included (Y/N)	Total amount exceeds $750K (Y/N)	Cost/Price Analysis (Note 1)

Note 1: Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) of the cost/price analysis for each individual subcontractor

CONSULTANTS Prime 1 (Fill-in)						
Name (Note 1)	Description of effort to be performed by the Consultant or attach Consultant Statement of Work	Number of Hours	Hourly Rate	Total	Supporting Documentation (Note 2)	Supporting Rationale (Note 3)
Base						
				$0.00		
				$0.00		
				$0.00		
Option I						
				$0.00		
				$0.00		
				$0.00		
				$0.00		

Instructions: • For Prime - fill out all columns if applicable. Indicate "Not Applicable" in B5 when there is no information to include.

Note 1: **Include a separate section in the above table for the Base and each Option.**

Note 2: **Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) used to support your price basis (e.g. copy of quote or agreement).**

Note 3: **Provide the location (section, page) in the proposal's Technical Basis of Estimate (BAA para 3.5.2.1.2) of the rationale for the necessity of the proposed consultant(s).**

MATERIALS - SUPPLIES (Note 1)		Prime 1 (Fill-in)						
Item (Note 2)	**Description of Material (include model number)**	**Qty**	**Unit Price**	**Total Price**	**Competitive /Sole Source**	**Vendor/Source (If known)**	**Supporting Documentation (Note 3)**	**Supporting Rationale (Note 4)**
Base				$0.00				
1				$0.00				
2				$0.00				
3				$0.00				
Option I				$0.00				
4				$0.00				
5				$0.00				
6				$0.00				
7				$0.00				

Instructions:

- Fill out all columns on the Materials/Supplies Tab for each item.
- Add additional lines if needed.
- Ensure that descriptions and vendors listed on the Materials/Supplies worksheet match information provided in the backup.

Note 1: **Material is property that may be incorporated into or attached to a deliverable end item or that may be consumed or expended in performing a contract. It includes assemblies, components, parts, raw and processed materials, and small tools and supplies that may be consumed in normal use in performing a contract. Material should be proposed separately from Equipment (see following**

Note 2: **Include a separate section in the above table for the Base and each Option.**

Note 3: **Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) of the documentation used to support your price basis (e.g. copy of quote, page from catalog, recent invoice or PO). If the supporting documentation is located on a website, then please provide a screen shot.**

Note 4: **Provide the location (section, page) in the proposal's Technical Basis of Estimate (BAA para 3.5.2.1.2) for the necessity of the proposed materials/supplies**

EQUIPMENT (NOTE 1)	Prime 1 (Fill-in)									
Item (Note 2)	Description of Equipment (include model number) (Note 1)	Will the equipment be included as part of a deliverable item under the award? (Y/N)	Type of Equipment (special test equipment, special tooling, general purpose equipment, or plant equipment) (Note 3)	Qty	Unit of Issue	Unit Price	Total Price	Vendor/Source	Supporting Documentation (Note 4)	Supporting Rationale (Note 5)
Base										
							$0			
							$0			
Option I										
							$0			

Instructions:

- Fill out all columns on the Equipment Tab for each item.
- Add additional lines if needed.
- Ensure that descriptions and vendors listed on the Equipment worksheet match information provided in the backup.

Note 1: **Contractors are normally required to furnish all equipment and/or facilities necessary to perform Government contracts (see FAR 45.102(a)). The Government may allow**

Note 2: **Include a separate section in the above table for the Base and each Option. Add additional lines labeled with Options if needed.**

Note 3: **Definitions:**
performing a contract. It consists of items or assemblies of equipment including standard or general purpose items or components that are interconnected and interdependent for installing special test equipment, and which are of such a specialized nature that without substantial modification or alteration their use is limited to the development or
Plant equipment means personal property of a capital nature (including equipment, machine tools, test equipment, furniture, vehicles, and accessory and auxiliary items) for

Note 4: **Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) used to support your price basis (e.g. copy of quote, page from catalog, recent invoice or PO).**

Note 5: **Provide the location (section, page) in the proposal's Technical Basis of Estimate (BAA para 3.5.2.1.2) of the rationale for the necessity of the proposed materials/supplies**

Prime 1 (Fill-in)

City, State	Trip Purpose	Number	Number of	Number	Air/Rail	Per Diem	Per Diem	Rental	Parking	Mileage	Taxi	Other	TOTAL	Supporting
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
		0	0	0	$0.00	$0.00	$0.00	$0.00	$0.00	0	$0.00	$0.00		
				Totals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	
TOTAL													$0	

- When completing the "From" and "To" information, enter the city and state where travel will originate and end. For example, from Seattle WA to Washington DC. Do not list airport codes.
- Include the trip purpose. It must be referred to in the Technical Proposal. Publications, conference attendance, and presentations are encouraged but must be justified to and approved by the Program Officer.
- Remember that you cannot stay overnight the same number of days that you travel. There must always be one more day than night.
- Do not combine any categories.
- For lodging and M&IE, use federal Per Diem Rates found at http://www.defensetravel.dod.mil/site/perdiemCalc.cfm.
- For M&IE, input the full rate in the white block. The gray block will automatically calculate the total to include 75% for the first and last day of travel.
- Submit backup for airfare and rental cars. Price airfare at economy rates; indicate if the airfare is refundable.

Estimates and the resultant costs claimed must conform to the applicable Federal cost principles.

Include a separate section in the above table for the base and each option

If there are miscellaneous expenses associated with the trip, provide description and rationale.

Provide the location (section, page) in the proposal's Cost Narrative/Supporting Documentation (BAA para 3.5.2.2.1) used to support your price basis (e.g. copy of quote, page from catalog, recent invoice or PO).

OTHER DIRECT COSTS (Note 1)			Prime 1 (Fill-in)	
Description (Note 2)	**Qty**	**Unit of Issue**	**Unit Price**	**Total Price**
Base				$0
				$0
				$0
Option I				$0
				$0
				$0
				$0

Instructions:

- If you have any ODC entries, be sure to fill out all columns.
- Ensure that descriptions and vendors listed on the ODC Detai

Note 1: **Examples include rental fees, shipping costs, license fees**

Note 2: **Include a separate section in the above table for the Base a**

respond to emails. Stay well.

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Tue, Jan 26, 2021 at 9:55 AM (b)(6)
Caution-mailto:(b)(6) > wrote:

(b)(6)

Great, thanks for your flexibility. Let's plan on Tuesday 09 February from 1000-1100, I just sent you a calendar invite with MS Teams information please share with any relevant personnel from EcoHealth Alliance.

Looking forward to the discussions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, January 25, 2021 12:18 PM
To: (b)(6)
Caution-
Cc: (b)(6)
Caution-
Caution-
Caution-
Subject: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dea (b)(6)

This is great to hear, thank you! Either February 8th or 9th at 10-11AM EST works for me. I will review your

modifications to the SOW and be prepared to discuss them.

I look forward to working with you.

Best,

(b)(6)

Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(twi (b)(6)

Cau

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Thu, Jan 21, 2021 at 8:39 AM (b)(6)
Caution-mailto (b)(6)
Caution-mailto

(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6)
(b)(6) I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

DTRA CB is still awaiting receipt of the remaining FY21 funds Congress has appropriated, however, prior

to award and kick off of this effort, we can work collaboratively to finalize the SOW and cost negotiations so we are on track to kick off this grant award in the first quarter of this calendar year. To that end, I have attached a red lined SOW that has DTRA requested changes for the proposed effort. Please review so we can discuss next steps. During these follow on discussions, please be prepared to discuss any questions, concerns, and associated cost, schedule, and contract changes that may need to be completed to address the requested changes.

The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday February 9th from 1000-1100 work for your team?

Look forward to working with you.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

NIPR (b)(6) ion-
Caution-mailto

SIPR > < Caution-
Caution-mailto >

From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award
Date: Monday, February 8, 2021 1:00:06 PM

Received, thanks (b)(6) Look forward to the discussions tomorrow.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, February 8, 2021 12:43 PM
To: (b)(6)
(b)(6)
Subject: Re: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

---

Dear (b)(6)

I am looking forward to our meeting tomorrow. I have attached my initial comments on the redlined SOW for us to discuss then.

Best,
(b)(6)
Principal Scientist, Computational Research

I am on part-time medical leave, working reduced hours for Jan-Feb 2021, and may take longer than expected to respond to emails. Stay well.

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)

(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Tue, Jan 26, 2021 at 9:55 AM (b)(6)
Caution-mailto:(b)(6) > wrote:

(b)(6)

Great, thanks for your flexibility. Let's plan on Tuesday 09 February from 1000-1100, I just sent you a calendar invite with MS Teams information please share with any relevant personnel from EcoHealth Alliance.

Looking forward to the discussions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, January 25, 2021 12:18 PM
To: (b)(6)
Caution
Cc: (b)(6)
Caution
Caution
Caution
Subject: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dear (b)(6)

This is great to hear, thank you! Either February 8th or 9th at 10-11AM EST works for me. I will review your modifications to the SOW and be prepared to discuss them.

I look forward to working with you.

Best,

(b)(6)

--

(b)(6)
Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)
(tw

Ca

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Thu, Jan 21, 2021 at 8:39 AM (b)(6)
Caution-mailt (b)(6)
Caution-mailt

(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6)
(b)(6) I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

DTRA CB is still awaiting receipt of the remaining FY21 funds Congress has appropriated, however, prior to award and kick off of this effort, we can work collaboratively to finalize the SOW and cost negotiations so we are on track to kick off this grant award in the first quarter of this calendar year. To that end, I have attached a red lined SOW that has DTRA requested changes for the proposed effort. Please review so we can discuss next steps. During these follow on discussions, please be prepared to discuss any questions, concerns, and associated cost, schedule, and contract changes that may need to be completed to address the requested changes.

The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday February 9th from 1000-1100 work for your team?

Look forward to working with you.

V/r,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

NIPR (b)(6) on-
Caution-mailto:

SIPR: < Caution-
Caution-mailto: >

From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award
Date: Tuesday, January 26, 2021 9:54:19 AM

(b)(6)

Great, thanks for your flexibility. Let's plan on Tuesday 09 February from 1000-1100, I just sent you a calendar invite with MS Teams information please share with any relevant personnel from EcoHealth Alliance.

Looking forward to the discussions.

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, January 25, 2021 12:18 PM
To: (b)(6)
(b)(6)
Subject: [Non-DoD Source] Re: FY21 DTRA Fundamental Research Award

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

Dea (b)(6)

This is great to hear, thank you! Either February 8th or 9th at 10-11AM EST works for me. I will review your modifications to the SOW and be prepared to discuss them.

I look forward to working with you.

Best,

(b)(6)
Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Thu, Jan 21, 2021 at 8:39 AM (b)(6)
Caution-mailto(b)(6) > wrote:

(b)(6)

Congratulations on your selection as a recipient of DTRA Fundamental Research Funding for your proposal in response to HDTRA1-14-24c-FRCWMD-BAA, "Predicting Biothreat Impacts from Early Stage Data via Transfer Learning." My name is (b)(6)
(b)(6) I am the Grant Officer's Representative (GOR) for this award. In this capacity, I will be your DTRA POC for this effort which includes monitoring the progress of the effort throughout its active R&D, conducting periodic program reviews via MS TEAMS, ensuring funding is sent in a timely manner for the R&D effort, and answering questions you may have relating to the R&D during this effort.

DTRA CB is still awaiting receipt of the remaining FY21 funds Congress has appropriated, however, prior to award and kick off of this effort, we can work collaboratively to finalize the SOW and cost negotiations so we are on track to kick off this grant award in the first quarter of this calendar year. To that end, I have attached a red lined SOW that has DTRA requested changes for the proposed effort. Please review so we can discuss next steps. During these follow on discussions, please be prepared to discuss any questions, concerns, and associated cost, schedule, and contract changes that may need to be completed to address the requested changes.

The next couple weeks are hectic for me, but would either Monday February 8th or Tuesday February 9th from 1000-1100 work for your team?

Look forward to working with you.

V/r,

(b)(6)

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies (CB)

Defense Threat Reduction Agency (DTRA)

(b)(6)

NIPR (b)(6)

SIPR:

From: (b)(6)
To:
Cc:
Subject: RE: [Non-DoD Source] Re: Notification of DTRA Grant Award -- HDTRA12110023 -- "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning
Date: Tuesday, July 27, 2021 9:22:00 AM

(b)(6)

Absolutely no problem. How about 1000-1100 on the 17th?

Thanks,
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Tuesday, July 27, 2021 9:09 AM
To: (b)(6)
Cc: (b)(6)
Subject: Re: [Non-DoD Source] Re: Notification of DTRA Grant Award -- HDTRA12110023 -- "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

---

Dear (b)(6)

We are delighted, as well! Unfortunately the week of Aug 9-14 some of my core team will be out. Would you be able to hold kick-off any time on Aug 16 or 17?

Best,

(b)(6)
Principal Scientist, Computational Research

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018

Caution-www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org >

+1.212.380.4471 (direct)
+1.212.380.4465 (fax)
(b)(6)

(b)(6)

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Mon, Jul 26, 2021 at 11:17 AM (b)(6)
Caution-mailto (b)(6) > wrote:

(b)(6)

I am delighted to receive news that this grant was finally awarded! Since it has been a while since we last touched base, I would like to schedule a grant kick off meeting in the coming weeks. This is an opportunity for your team to brief us on the proposed approach to each of the tasks for the BP as outlined in the SOW and answer any outstanding questions.

Would you be available to support a virtual meeting from 1000-1100 on Wednesday August 11th?

Thanks,

(b)(6)
Digital Battlespace Management Division (CBI)
Chemical and Biological Technologies (CB)
Defense Threat Reduction Agency (DTRA)
(b)(6)
NIPR (b)(6)
SIPR:

-----Original Message-----
From: (b)(6)
Sent: Monday, July 19, 2021 4:32 PM
To: (b)(6)
Caution-
Cc: (b)(6) (b)(6)
(b)(6)
Caution-mailto (b)(6) >; (b)(6)
Caution-mailto (b)(6)
Subject: [Non-DoD Source] Re: Notification of DTRA Grant Award -- HDTRA12110023 -- "Predicting Biothreat Impacts from Early-Stage Data via Transfer Learning

Daer (b)(6)

I confirm receipt and we are delighted to revive this Grant award!

Please note our address may need to be updated, since it now is:

EcoHealth Alliance
520 Eighth Avenue
Suite 1200
New York, NY 10018

Thank you!

(b)(6)
Chief of Staff

EcoHealth Alliance
520 Eighth Avenue, Suite 1200
New York, NY 10018-4182

+1.212.380.4473 < tel:1.212.380.4469 > (office)
+1.917.385.5267 < tel:1.646.413.3437 > (mobile)
Caution-Caution-www.ecohealthalliance.org < Caution-http://Caution-Caution-www.ecohealthalliance.org > < Caution-Caution-http://www.ecohealthalliance.org < Caution-http://www.ecohealthalliance.org > >

EcoHealth Alliance develops science-based solutions to prevent pandemics and promote conservation.

On Jul 19, 2021, at 15:56, (b)(6)
< Caution-mail(b)(6)
Caution-mailto

(b)(6)

Congratulations! Attached for your records is the subject Grant award. Please let me know if you have any questions about the attached document. FYSA - also cc'ed to this email is the GOR for this effort, (b)(6)

Thank you,

(b)(6)
Contracting Officer
Defense Threat Reduction Agency, AL-ACR
Phone (b)(6)
Ema(b)(6) < Caution-
Caution-mailto >

<HDTRA1-21-1-0023.pdf>

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From: (b)(6)
To:
Cc:
Subject: RE: CB11030 EcoHealth Alliance New Grant remainder of funding requirement
Date: Thursday, March 25, 2021 12:11:21 PM

HI (b)(6)

Complete concurrence with your plan below. Thank you for making the adjustments. The package is ready to route, we are just waiting on the address and financial POC to include on the REGA.

Let me know if you need any more info!

Thanks,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate
Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTR (b)(6)
NIPR
SIPR

-----Original Message-----
From: (b)(6)
Sent: Thursday, March 25, 2021 10:10 AM
To: (b)(6)
(b)(6)
Subject: RE: CB11030 EcoHealth Alliance New Grant remainder of funding requirement

HI (b)(6)

Thanks for the heads up.

I think pulling (b)(4) from the (b)(4) effort would work best. Technically EcoHealth Alliance doesn't need the full base year amount in FY21 dollars, (b)(4) think it makes sense to fund as much of (or all) of the base year as possible so (b)(6) funded for all efforts to make decisions off of. (b)(4)
(b)(4)

With that being said, if (b)(6) strongly favors th (b)(4)

what is planned for EcoHealth, maybe we want to shift funds differently. Ultimately I defer to you both on priority for these two efforts. Hopefully that makes sense.

(b)(4)

Below is a summary of the changes (assuming you are good with the (b)(4) shift from (b)(4) EcoHealth), please confirm you are good with these and I can update SMART accordingly.

(b)(4)

CB11030 (EcoHealth) - LF1BR
Current: $250,000.00
Adjustment: +$3,279.10
Revised: $253,279.10

Thanks!
(b)(6)
RD-CBI
Defense Threat Reduction Agency
Office: (b)(6)

-----Original Message-----
From: (b)(6)
(b)(6)
Sent: Wednesday, March 24, 2021 1:28 PM
To: (b)(6)
Cc:
Subject: CB11030 EcoHealth Alliance New Grant remainder of funding requirement

Hi (b)(6)

PR package coming your way for the CB11030 EcoHealth Alliance New Grant. Per our discussion, we have $250k allocated for the Base Year, but the final cost came in at $253,279.10. I know you are looking into pulling that remaining (b)(4) to cover. Let me know if you need anything else from me.

Thanks for working this!

Advisory & Assistance Services (A&AS) - Dynamis

Defense Threat Reduction Agency

Research and Development Directorate

Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)

NIPR:
<mailt

SIPR:
<mailt

From: (b)(6)
To:
Cc:
Subject: RE: CBI New Grant Awards - Proposal Needed
Date: Wednesday, March 17, 2021 8:59:25 AM

Hi (b)(6)

I the folder here:

J:\Restricted\RD\CB\1601.01 Project Mgmt\CBI\2 - Projects\1 - Active\Analytics & Data\CB11030 - EHA Predicting Biothreat Impacts\1 - Contract documents

Thanks,

(b)(6)

Advisory & Assistance Services (A&AS) - Dynamis
Defense Threat Reduction Agency
Research and Development Directorate
Chemical and Biological Technologies, Department Digital Battlespace Management Division (CBI)

"Creativity Begets Innovation" (CBI)

DTRA (b)(6)
NIPR:
SIPR:

-----Original Message-----
From: (b)(6)
Sent: Wednesday, March 17, 2021 8:28 AM
To: (b)(6)
(b)(6)
Subject: RE: CBI New Grant Awards - Proposal Needed

Ahhh, this is great!! Glad we don't need to go through this process if it was already done :)

(b)(6) Did you also have a copy of the Form 58 for your PR folder or do you need me to track it down from Sam?

(b)(6) RD-CBI
Defense Threat Reduction Agency
Office: (b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, March 17, 2021 8:25 AM
To: (b)(6)
(b)(6)
Subject: RE: CBI New Grant Awards - Proposal Needed

Good catch (b)(6) yup I've got #9 saved from Sam in our folder if you want to take a look (b)(6)

J:\Restricted\RD\CB\1601.01 Project Mgmt\CBI\2 - Projects\1 - Active\CB11026 - UMICH Hybrid Learning for Dispersion Modeling\1 - Contract Documents\Acquisition Documents\1 - New Grant

V/R,

(b)(6)
A&AS DTRA RD-CBI "Creativity Begets Innovation"
(b)(6)
DTR (b)(6)
Cell:

-----Original Message-----
From: (b)(6)
Sent: Wednesday, March 17, 2021 8:24 AM
To: (b)(6)
(b)(6)
Subject: RE: CBI New Grant Awards - Proposal Needed

Thanks (b)(6) I believe (b)(6) already completed a security review for these, so you may want to check with him first before initiating.

Thanks
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, March 17, 2021 8:16 AM
To: (b)(6)
(b)(6)
Subject: CBI New Grant Awards - Proposal Needed

Hi All,

Please save a copy of the grant proposal for the following efforts (new grants) to the following folder located here (b)(5)

(b)(5)

CB11026: University of Michigan

CB11030: EcoHealth Alliance

CB11032: Philips

An item on the 'New Grant' checklist includes a Security Review so I will route these through PA. The process takes a few weeks so please save your proposal as soon as possible.

More to come on 'New Grant' checklist..

Thanks,

(b)(6)

Digital Battlespace Management Division (CBI)

Chemical and Biological Technologies Department

Research & Development Directorate

Defense Threat Reduction Agency

Office (b)(6)

From: (b)(6)
To:
Subject: RE: EcoHealth Alliance and Wuhan Institue of Virology
Date: Wednesday, May 5, 2021 1:21:13 PM

Hi (b)(6)

I have seen the request and concur that to my knowledge funding for these efforts was not given to or used in collaboration with WIV.

Thanks
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, May 5, 2021 11:41 AM
To: (b)(6)
Subject: EcoHealth Alliance and Wuhan Institue of Virology

Hi (b)(6)

I hope you are doing well! Contracting received a congressional inquiry today regarding EcoHealth Alliance's relationship with the Wuhan Institute of Virology. CBA had two contracts with EcoHealth for Global Rapid Identification Tool System (GRITS). The first effort was HDTRA1-13-C-0029 and the follow-on was HDTRA1-15-C-0041. You were the COR on 15-C-0041. I have reviewed both contracts and it does not appear that funding for these efforts was given to or used in collaboration with the WIV. Can you verify this to be correct, to your knowledge?

Thanks in advance!

(b)(6)

Contracting Officer

Defense Threat Reduction Agency, AL-ACR

Phone: (b)(6)

Email: (b)(6)

From: (b)(6)
To:
Subject: RE: Final Patent Clearance - HDTRA1-15-C-0041
Date: Tuesday, February 27, 2018 9:42:48 AM

Thanks (b)(6)

(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, February 26, 2018 2:38 PM
To: (b)(6)
Cc:
(b)(6)
Subject: RE: Final Patent Clearance - HDTRA1-15-C-0041

Hello (b)(6)

The Global Rapid Identification Tool Set (GRITS), Flight Risk Tracker (FLIRT) and EIDR Connect and all software applications which were delivered under the subject contract. We did accept delivery and do have the source code for each of these applications. I do not require any additional information.

Thanks,

(b)(6)

Contracting Officer's Representative (COR)
Science & Technology Manager
Research and Development Directorate
Chemical and Biological Technologies Department
Defense Threat Reduction Agency
8725 John. J. Kingman Road, Stop 6201
Fort Belvoir, VA 22060-6201
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Monday, February 26, 2018 12:50 PM
To: (b)(6)
(b)(6)
Cc: (b)(6)
(b)(6)
Subject: FW: Final Patent Clearance - HDTRA1-15-C-0041

Hello (b)(6)

Ecohealth Alliance lists three inventions on their final DD882. Are these inventions software programs or something else? Did we accept delivery of

these programs, and do we need any more information on them?

Thanks,

(b)(6)

DTRA IP Counsel
Office of the General Counsel
(b)(6)

CAUTION: This message may contain information protected by the attorney-client, attorney work product, deliberative process, or other privilege. Do not disseminate without the approval of the DTRA Office of the General Counsel.

-----Original Message-----
From: (b)(6)
Sent: Thursday, February 22, 2018 10:39 AM
To: (b)(6)
Subject: Final Patent Clearance - HDTRA1-15-C-0041

Hi (b)(6)

Can you please provide final patent clearance for the subject effort to facilitate closeout? The effort provided a global rapid identification tool system for diagnosing infectious disease bioevents, had a POP of 9 APR 15 to 30 SEP 17, and the PM for this effort was (b)(6)

Thank you,

(b)(6)

From: (b)(6)
To:
Subject: RE: HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC.
Date: Friday, April 6, 2018 9:15:00 AM

(b)(6)

Yes, the report is acceptable.

(b)(6)
Contracting Officer's Representative (COR)
Science & Technology Manager
Information Systems & Surveillance Division
Research and Development Directorate
Defense Threat Reduction Agency
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Friday, April 6, 2018 8:14 AM
To: (b)(6)
(b)(6)
Subject: HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC.

(b)(6)

Attached is the final technical report for award HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC. Please let me know if the report is acceptable.

(b)(6)
Contract Administrator
ONR Boston Regional Office
495 Summer Street
Boston, MA 02210
(b)(6)

From: (b)(6)
To:
Subject: RE: HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC.
Date: Wednesday, August 1, 2018 8:39:00 AM

Good Morning,

Yes, this report is acceptable for award closeout.

(b)(6)
Contracting Officer's Representative (COR)
Science & Technology Manager
Information Systems & Surveillance Division
Research and Development Directorate
Defense Threat Reduction Agency
(b)(6)

-----Original Message-----
From: (b)(6)
Sent: Wednesday, August 1, 2018 8:08 AM
To: (b)(6)
(b)(6)
Subject: HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC.

Good morning,

Please see the attached final patent report for award HDTRA1-15-C-0041 - ECOHEALTH ALLIANCE INC.

Please let me know if the report is acceptable for award closeout.

(b)(6)
Contract Administrator

ONR Boston Regional Office

495 Summer Street

Boston, MA 02210

(b)(6)